

CA | Energy Efficiency Strategic Plan

HVAC Action Plan Heating Ventilation Air Conditioning 2010-2012

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OVERVIEW

This Heating Ventilation and Air Conditioning (HVAC) Action Plan is designed to help California's HVAC sector achieve the goals described in *The California Energy Efficiency Strategic Plan* ("The Strategic Plan" or "the Plan," published by the California Public Utilities Commission [CPUC]).¹ In addition, the California Energy Commission's (CEC) *Strategic Plan to Reduce the Energy Impact of Air Conditioners*² and the *Recommended Strategic Plan to Transform the Existing HVAC Industry and Achieve Additional Peak Savings, Sustainable Profitability, and Increased Customer Comfort*³ (also known as *The HVAC Convener's Report*) provide substantial background and detail that make up the platform for this action plan.

BACKGROUND

The HVAC Action Plan builds on workshops that were held throughout 2006-2009, including those leading up to the CEC and the CPUC's strategic plans published in 2008. In 2009, CPUC's Energy Division established the process that led to the Commercial Zero Net Energy (ZNE) Action Plan,⁴ which was launched in 2010. The HVAC Action Plan reflects the structure of the Commercial ZNE Action Plan. It includes input from the strategic plans, along with contributions from CPUC Energy Division staff, California's investor-owned utilities (IOUs), the Western HVAC Performance Alliance (WHPA) and other HVAC stakeholders, including manufacturers, contractors, distributors and code officials. Since 2006, there have been more than 100 meeting and workshops with dozens of participants from all parts of the HVAC spectrum that have led to the development of convener's reports, strategic plans and several action plans. Key meetings include:

- **October 2006 PIER HVAC Roundtable.** Participants from HVAC industry, researchers, utilities, and local engineering professionals made key recommendations for industry-wide collaboration on fault detection and diagnostics (FDD), as well as improvements to equipment control and maintenance features. Many of the recommendations were incorporated in various forms in the HVAC Convener's Report, in the CPUC and CEC strategic plans related to HVAC.
- **Big Bold Energy Efficiency Workshops.** In 2007, the CEC and CPUC opened discussions on the next rounds of energy efficiency planning. There was an intense period of workshop activity to explore "big bold" strategies and to review and recommend priorities. Dozens of participants across the HVAC spectrum participated in the workshops focused on HVAC issues.
- **May 2009 HVAC Roundtable.** At this gathering of 75 participants representing a broad cross-section of in-state and national organizations (public and private) in San Francisco, the Western HVAC Performance Alliance (WHPA) was born.⁵ The Alliance was formally chartered following the roundtable with a steering committee and several committees and subcommittees working on a range of Strategic

¹ CPUC, *The California Efficiency Strategic Plan* (Sep 2008), http://www.engage360.com/images/stories/ceesp/caenergyefficiencystrategicplan_jan2011.pdf

² California Energy Commission, *Strategic Plan to Reduce the Energy Impact of Air Conditioners* (Jun 2008), <http://www.energy.ca.gov/2008publications/CEC-400-2008-010/CEC-400-2008-010.PDF>

³ Mike Messenger, *The HVAC Convener's Report* (Jan 2008), <http://www.performancealliance.org/LinkClick.aspx?fileticket=n5AaFTvGHUI%3d&tabid=212&mid=700>

⁴ ZNE Stakeholders, *The Zero Net Energy Action Plan* (Sep 2010), <http://www.cpuc.ca.gov/NR/rdonlyres/6C2310FE-AFE0-48E4-AF03-530A99D28FCE/0/ZNEActionPlanFINAL83110.pdf>

⁵ See page 3 for more detailed information on the WHPA.

Plan support initiatives. Currently, over 70 private and public organizations, both in-state and national, are members of the WHPA.

- **HVAC Action Plan Stakeholder Workshop.** Held in March 2011, this workshop secured public feedback on HVAC progress to date and was used to vet the draft HVAC Action Plan (including key actions, timelines and suggestions on priorities for the future). For a list of attendees, please see Appendix D.

THE STRATEGIC PLAN

Published in 2008, the Strategic Plan outlines goals and strategies for key market sectors (commercial, residential, etc.) and crosscutting resources (e.g., HVAC).⁶ In order to reduce barriers to the adoption of efficiency measures (to the point where publicly-funded intervention is no longer appropriate or necessary) the Plan embraces four specific programmatic goals, known as the Big Bold Energy Efficiency Strategies or “BBEES” set forth in CPUC Decision 07-10-032.⁷ This focus on market transformation and recognition that deep energy savings can only be achieved through a common vision and coordinated efforts of both utility and non-utility entities is the fundamental point of departure for the Strategic Plan. Unlike traditional regulatory approaches, the Plan identifies near-term, mid-term and long-term milestones to move the state towards these BBEES. The Big Bold Energy Efficiency Strategies are:

- All new residential construction in California will be zero net energy by 2020.
- All new commercial construction in California will be zero net energy by 2030.
- Heating, Ventilation and Air Conditioning (HVAC) will be transformed to ensure that its energy performance is optimal for California’s climate.
- All eligible low-income customers will be given the opportunity to participate in the low-income energy efficiency program by 2020.

As part of the Plan’s efforts to achieve maximum energy savings via the BBEES, innovations in a range of technologies, services and even philosophies in program design are required. Stretching beyond the scope and participation of the existing ratepayer-supported utility programs, achieving the goals in the Strategic Plan requires involvement of stakeholders outside of IOUs. While the Strategic Plan is a policy-oriented document that sets forth leadership and vision, the HVAC Action Plan is a way to operationalize the HVAC goals of the Strategic Plan. Not only does this document help the broader California community proceed step-by-step towards achieving the Strategic Plan’s HVAC vision, but it also provides meaningful engagement for stakeholders. This document focuses on the Strategic Plan’s four goals for the HVAC



⁶ CPUC (Sep 2008), Table of Contents.

⁷ Ibid, p. 4.

sector: code compliance (Goal 1), quality installation and maintenance (Goal 2), whole-building design (Goal 3) and new technologies and diagnostics (Goal 4). For each goal, the Strategic Plan contains a matrix of strategies and milestones necessary to achieve the goal over a specified time frame (near-term, mid-term or long-term).

THE WESTERN HVAC PERFORMANCE ALLIANCE

“To achieve the Commission’s adopted Programmatic Initiative [sic] of transforming the HVAC market and the four specific goals identified above, broad-based and aggressive strategies are needed that involve many stakeholders beyond the Commission and IOUs. An HVAC Advisory Group (working group) should be chartered to involve high-level HVAC industry stakeholders—such as manufacturers, distributors, and contractors—to coordinate industry sponsorship of and participation in HVAC strategies. Membership should also include other key players, such as the CPUC, Energy Commission, utilities, building owners/managers, consumers, and the Federal government.”⁸

As discussed in the HVAC Convener’s Report, the CEC’s Air Conditioning Strategic Plan and the California Energy Efficiency Strategic Plan, HVAC industry organizations are not traditionally structured to contribute the level of involvement envisioned and necessitated by the Strategic Plan. As such, the Western HVAC Performance Alliance (WHPA), established in 2009, has a unique role in the development and implementation of this action plan. This advisory group was formed at the direction of the Strategic Plan (per the excerpt above) specifically to provide the California IOUs with expert counsel from the HVAC industry to achieve the goals of the Plan.

Originally established in D. 07-10-032 as an IOU task force, the WHPA has grown into an essential partner in the action plan, driving private and public sector cooperation towards achieving the Plan’s goals. In addition to approving ratepayer funding to support the WHPA as part of the statewide HVAC program, the CPUC is also a member of the WHPA. The WHPA is a membership group of organizations, not individuals, dedicated to the advancement of the HVAC goals of the action plan. Per its charter, WHPA is open to both member and nonmember champions on committees related to specific HVAC Action Plan strategies and milestones.⁹ With a committee structure aligned with HVAC Strategic Plan goals, the WHPA is the core organizing vehicle, resource for progress tracking and “home” to the champions network leveraged in this action plan.

⁸ CPUC (2008), p. 55

⁹ WHPA, Charter (Nov 2009), p. 6-7.

<http://www.performancealliance.org/LinkClick.aspx?fileticket=oPHmNaD8Tul%3d&tabid=171&mid=648>

THE ACTION PLANS

Engaging industry leaders and influencers, as well as relevant agencies, stakeholders and utilities, is critical for successful implementation of the Plan. To make stakeholder participation in strategic planning activities meaningful and focused on achieving milestones, the HVAC Action Plan is designed to identify the actions required to achieve the four HVAC “goal results” of the Strategic Plan:

1. HVAC-related permits are obtained for 50 percent of installations by 2015.
2. By 2020 100 percent of systems are installed to quality standards and optimally maintained.
3. Integrated design and construction practices are standard practice by 2020.
4. At least 15 percent of equipment shipments are optimized for California’s climate by 2015.

Prioritized Strategies. The HVAC Action Plan is designed to achieve milestones identified in the Strategic Plan. However, with 31 milestones in the sector recommended for implementation in 2010-2012 alone, actions must be prioritized. Moreover, given both the dynamic nature of the energy efficiency marketplace and concurrent efforts in other sectors, the HVAC Action Plan does not seek to launch all milestones identified in the Plan by 2011, nor does it provide a highly detailed plan for the entire near term (2010-2012) implementation. It does not catalog every HVAC-related activity currently underway in California; that is not its purpose. The HVAC Action Plan does, however, include information on a number of activities already underway in support of the priority activities.

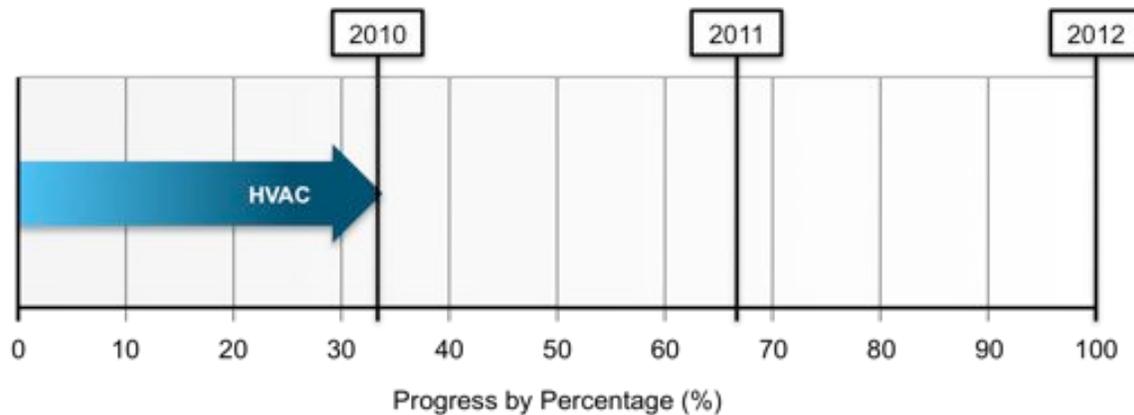
Champions Network. A core focus of this action plan is continued work with the broader stakeholder community, including manufacturers, contractors, local governments and others. It is essential to track progress, foster accountability and acknowledge success, as well as generally provide high-level coordination to accelerate progress. Industry leaders are being continuously identified—and stepping forward—to take on responsibility for the achievement of specific milestones in the Strategic Plan. These champions include people from relevant state agencies, buildings industry, utilities, and a range of trade groups and nonprofit organizations. Many of the champions who have volunteered are already working on some aspect of the action plan in their professional work. In the near-term, the CPUC will serve as a central organizational point for Plan champions, providing both online (www.Enage360.com) and offline facilitation of the champions’ network, as well as tracking progress towards milestones. Additional champions from the broader marketplace will be essential to truly institutionalize the Plan in the fabric of the state.

Action Detail. With more than 100 pages and even more strategies across 12 sectors, the Strategic Plan must be segmented into a series of discreet achievable tasks that together result in achievement of milestones. Essentially, the action plan is project management applied to a policy document. Tasks aligned with a milestone (displayed as “key actions” in the ensuing pages) are developed in coordination with stakeholders and industry experts. Tasks are ordered in a step-wise approach to achieve milestones, and are the heart of the action plan. Additionally, project management tools are employed to (a) identify groups already working on key issues related to the HVAC Action Plan, (b) identify champions who can take responsibility for specific milestones, (c) estimate time to complete a specific action and (d) record progress to date.

Progress Indicators. Action plans, by providing the ability to track progress, vastly improve California’s chances of achieving the goals of the Strategic Plan. Progress indicators, based on a simple calculation, enable a “bird’s eye view” of areas of significant achievement, as well as areas where additional resources or support are needed to stay “on track” to achieve the Plan’s goals. For each milestone, there are an established number of actions. Progress is measured as “percentage complete” by dividing the

number of actions completed by the total number of actions. While it may be ideal to develop a weighted approach (as achieving some milestones have a significant ripple effect) or to develop a formula that equates a score with activities that are ahead of, behind, or on schedule, this simple method provides for a general gauge for progress against the Plan. Processes that are considered “ongoing” (such as updating codes) will be listed as 50 percent complete as of January 2011, as we are half-way through the Plan’s near-term (2010-2012) implementation cycle. Non-priority strategies do not have these indicators.

Overall Progress. In addition to the progress tracking at the strategy level, the HVAC Action Plan provides a snapshot of progress against the Plan’s HVAC goals in totality. To be considered “on track,” overall indicators reflect milestones for the 2010-2012 cycle that are generally one-third complete at the end of 2010, two-thirds complete at the end of 2011 and 100 percent complete at the end of 2012. Ideally, halfway through this near-term implementation cycle, HVAC Action Plan average progress will be at 50 percent. Currently at 33 percent, the HVAC AP is slightly behind target progress – but significant steps forward are expected in the second half of 2011.



THE STATE OF THE HVAC MARKET

The HVAC industry is a key target for major restructuring. Heating and cooling buildings is one of the largest electricity end uses in the state and is also the single largest contributor to peak power demand, comprising up to 30 percent of total demand in the hot summer months.¹⁰ Meanwhile, from a market perspective, the industry is highly competitive and segmented. The HVAC market is characterized by incredible diversity of segments (ranging from single family to large commercial campuses), a complex patchwork of building codes and permit requirements, and perhaps the highest permitting noncompliance rate in any industry in the state. The CEC estimates that less than 10 percent of HVAC work is performed under proper building permits, which trigger the minimum performance standards required by building codes.¹¹ Further, dissemination of “best practices” suffered during the housing boom from 1990 to 2002, due in part to the difficulty of finding enough trained HVAC technicians to serve demand.¹² While there is a growing niche of high-performance contractors, the industry, as a whole, has yet to return to the higher-quality installations formerly the norm in California.

¹⁰ CPUC (Sep 2008), p. 58

¹¹ CEC (Jun 2008), p. 7

¹² Ibid. p. 5

With poor installation and maintenance the most significant obstacle to increasing energy savings in the HVAC sector—resulting in HVAC system over-use by 20 to 30 percent, regardless of rated efficiency¹³—realizing the goals of the Strategic Plan must focus on manufacturers and distributors, as well as consumers and contractors. In same way that manufacturers have been slow to improve efficiencies of systems (and instead primarily designing to federal minimum standards when required), distributors generally stock inventories of the least efficient equipment allowed by code in order to offer the lowest priced products and compete in the marketplace. This cycle is largely driven by California's HVAC consumers.

Largely uninformed and confused as to what defines quality installation (QI), consumer education is a crucial element in changing the HVAC status quo. Quality installation is a cornerstone to realizing HVAC's energy efficiency potential through savings gained from correct unit sizing, duct sealing and air flow. The impact of poorly installed systems has been a significant loss of energy savings to the state for years. In the 2008 *Strategic Plan to Reduce the Energy Impact of Air Conditioners*, the CEC estimates that potential cumulative savings from higher quality HVAC installation in the residential and small commercial markets could reach 1,216 GWh and 1,096 MW by 2020.¹⁴ This represents roughly two combined-cycle gas-fired power plants (500 MW each).

More, these savings cannot continue to be realized and counted on over time unless the industry employs ongoing quality maintenance (QM) products and procedures that ensure peak performance of HVAC systems. Although savings vary with the condition of the equipment, it is estimated that regular maintenance can provide significant energy savings over unmaintained HVAC systems. To achieve the QM goals of the Strategic Plan, system diagnostics—including airflow, controls/sensors, economizer, refrigeration cycle—must proliferate in the market, to allow for mid-lifecycle corrections and prevent emergency replacements that may be of lower efficiency than would otherwise be selected. This effort must include a national and state-level audience, including both ASHRAE (engineers) and the International Code Council (code officials).

Still, there is significant reason to believe the Strategic Plan is driving change. Prior to the current program cycle (the first significantly influenced by the Plan), IOU rebates were limited and placed no upfront requirements on contractors to hire skilled workers, perform work to quality specifications, or obtain required building permits. Utility QI programs are now underway and other, similar programs are expected to be initiated in this funding cycle. In addition, several other efforts across the state—including the ZNE Action Plan, Energy Upgrade California and a host of efforts on the federal level—are elevating the importance of key Strategic Plan elements (QI/QM, fault detection and diagnostics, etc.) and supporting the goals of transforming the market.

CRITICAL SUCCESS FACTORS

- **Training and Compliance.** High turnover, low barriers to entry and lack of a credible threat for noncompliance on HVAC permitting are significant challenges to overcome. California must set standards for quality work and licensing, as well as reach the hundreds of contractors still uncommitted to QI/QM.
- **Financial feasibility.** Financial feasibility is needed across the board (for customers, contractors and manufacturers) to achieve the sought after improvements to HVAC technology, technical

¹³ Ibid, p. v (abstract)

¹⁴ Ibid, p. 36

training/credentialing, and contractor service approaches. Establishing the most effective incentives to consumers with ratepayer dollars is essential.

- **Quality Awareness.** The HVAC marketplace includes a wide variety of consumers, as well as thousands of manufacturers, services providers and building occupants. Any effort to break down the barriers to market transformation must instill awareness and understanding of the value proposition that quality brings along the value chain.
- **Statewide coordination.** A broadly representative group, including a range of public and private sector volunteers, must coordinate and advance the action plan. Achieving HVAC goals is complex, requiring changes to code development, product improvements and financial mechanisms—all of which benefit from statewide coordination.
- **Track and report on progress.** In order to advance the Plan's goals and strategies—and successfully create demand for quality installation—the HVAC Action Plan must track and report on progress. Ongoing stakeholder engagement will benefit from visible demonstrations of success and tracking how the strategies and milestones are working both independently and collectively to achieve the Strategic Plan goals.

THE 2010–2012 ACTION PLAN

The HVAC Action Plan includes:

- **Strategies** - An overview of the strategy and why certain actions are considered priority activities.
- **Progress to Date (2010-2012)** - A graphical depiction of milestone progress, based on percent complete in the action plan. This section is omitted for non-priority strategies.¹⁵
- **Action Plan (2010-2012)** - Identifies the milestones to achieve the strategy and has specific activities, is time bound and is aligned with champions in the industry.
- **Priorities For The Future (2013-2030)** - Additional actions that were identified via stakeholders as potential strategies/milestones to include in an update to the Strategic Plan.

GOAL 1: IMPROVE CODE COMPLIANCE

The following strategies are focused on Goal 1: “Consistent and effective compliance, enforcement and verification of applicable building and appliance standards.”

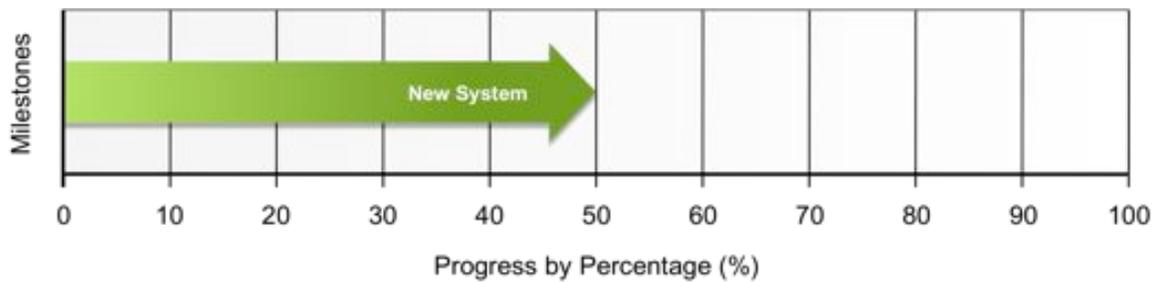
STRATEGY 1-1: DEVELOP STREAMLINED LOCAL GOVERNMENT HVAC PERMITTING SYSTEMS, INCLUDING ONLINE HVAC REPLACEMENT PERMITTING

While the CEC regulates HVAC installations through the state’s building code, Title 24 (T24), building codes are enforced through local governments and building departments. California is notorious for a high-level of noncompliance with current building codes that require HVAC contracting firms to pull a permit for all replacements of central air conditioning systems, as well as have the system performance measured and verified by third party raters. The entire compliance process begins with the contractor taking out a permit. If this doesn’t happen, the HVAC measures will not necessarily be installed or verified. It is estimated that only 10 percent of replacement HVAC work is performed with proper building permits, leaving the state hamstrung in its ability to ensure the minimum performance standards and deliver HVAC energy savings.¹⁶ Given the vital role that HVAC permits play in reaching Plan goals, a range of options to encourage contractors to apply for permits—including reducing time spent waiting for permits, and the development of online permit systems—are high priorities for near-term implementation (2010-2012).

¹⁵ In the case of HVAC, the current version of the action plan only identifies one strategy (1-2: Streamline Process for Obtaining and Overseeing Contractor Business Licenses) as non-priority for 2011.

¹⁶ Conveners Report, Appendix B.

PROGRESS TO DATE (2010-2012)¹⁷



The WHPA has been working to streamline online permitting systems since 2010 (including pilots detailed below) and is approximately half-way towards achieving the near-term (2010-2012) milestone. Some examples of progress include:

- **New Permit Forms.** In partnership with CEC staff and the WHPA, several distinct permit forms were combined and simplified for the majority of HVAC unit installations and ducting (CF 1R-ALT HVAC for Residential and MECH-1C-ALT-HVAC for Commercial). The residential form was reduced by 80 percent (from 5 pages to 1), saving approximately 40 percent in administrative hours.¹⁸
- **Online Permitting Pilot.** In partnership with the WHPA, the California Association of Local Building Officials (CALBO) is tracking a pilot for online permitting systems including El Centro, Oakley, Antioch, Big Bear, Napa, Plumas, Vacaville and Fairfield. In addition, several jurisdictions (including Los Angeles) have developed proprietary online systems.
- **HVAC Online Permitting Software.** A growing number of companies, including Accela (<http://www.accela.com>) and Enalaysis (<http://www.enalaysis.com>), have developed software for online permit systems for municipalities of all sizes. These programs speed permitting time and improve revenue streams for local governments by increasing permit fee revenues.

¹⁷ "Progress by Percentage" divides the number of actions completed by the total number of actions to complete a milestone. Processes that are considered "ongoing" (such as updating codes) are listed as one-third complete in 2010, two-thirds in 2011 and three-thirds in 2012. These charts will be updated regularly on www.Engage360.com.

¹⁸ (Bob Weismann, telephone interview, September 15, 2010.)

1-1 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
1-1-1 Convene an industry/local government stakeholder group; develop proposed new system; pilot test with local governments	WHPA Permitting Committee	Identify key government officials, as well as industry representatives for group	Complete
		Assess and review existing online permitting software options and permit options	Complete
	Eurlyne Geiszler, CEC	Identify local governments for pilot programs and launch permitting pilot	Complete
		Review pilot program performance (including number permits filed, contract satisfaction)	Q4 2011
		Share results and develop recommendations for local governments for online permit options	Q1 2012
		Promote value of permits to building owners	Q2 2012

PRIORITIES FOR THE FUTURE

- **Develop a statewide online permitting system.** In addition to establishing consistency throughout all climate zones in the state, an online system could be a low-cost way to ensure the greatest permit use. Currently, the CEC has regulatory and financial constraints that limit its ability to establish such a statewide system. These limits could be addressed in the future.
- **Bulk purchase online permitting software.** Currently, some online permitting software products are cost-prohibitive for cities and counties. Group or regional purchases, brokered appropriately, could dramatically reduce the purchase price of available products. Financial support may be necessary to enable some jurisdictions to implement online systems, and consideration should be given to providing financial support for implementing online permitting systems for cash strapped local governments.

STRATEGY 1-2: STREAMLINE PROCESS FOR OBTAINING AND OVERSEEING CONTRACTOR BUSINESS LICENSES

Contractors that serve California's HVAC industry need to obtain both a contractor license from the Department of Consumer Affairs' Contractor State License Board (CSLB) and a business license for the city and county they are based in. Unlicensed HVAC contractors are part of the \$60-\$140 billion dollar underground economy that does not pay taxes, insurance, or follow safety laws.¹⁹ While important in the overall efforts to achieve the goals of the Strategic Plan, the particular focus on streamlining contractor business licenses is a low priority, as it is not clear that there is a direct relationship between contractors with businesses licenses and the quality installation and maintenance provided. Fixing the licensing process is a mammoth task that stretches far beyond the industry itself, and does not actually prohibit noncompliance or ensure compliance. Further work on this strategy will begin in 2012.

¹⁹ "Basic Facts about Contracting in California," California State Licensing Board, last accessed May 24, 2011, <http://www.cslb.ca.gov/GeneralInformation/About/BasicFactsAboutCslb.asp>.

1-2 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
1-2-1 Pilot test streamlined process with local building departments	Individual jurisdictions statewide working with CSLB	Inventory the needs for an improved business license process	Q1 2012
		Develop a pilot program that would address needs	Q1 2012
		Identify local building programs to run pilot	Q1 2012
		Review, compile and promulgate results	Q2 2012
1-2-2 Explore possible common business licenses for multiple jurisdictions	Individual jurisdictions statewide working with CSLB	Identify key bodies to study multijurisdictional licenses	Q3 2012
		Assess pros and cons of one license for multiple jurisdictions	Q3 2012
		Deliver recommendations to identified above	Q4 2012

STRATEGY 1-3: REPLACE TITLE 24 CURRENT OPTIONAL QUALITY CONTROL REQUIREMENTS WITH MANDATORY REQUIREMENTS (ACCA/ANSI QI/QM SPECIFICATION)

Title 24 is identified throughout the Strategic Plan as a key lever to achieve California’s maximum energy efficiency savings. However, there is a disconnect between Title 24—the state’s main tool for building and HVAC regulations—and what is actually required to improve the quality of HVAC installations. Title 24 is focused on particular measures and products with federally set efficiency ratings. To truly achieve the best and most persistent energy savings, T24 must evolve to include whole building approaches and consistent requirements statewide, such as those put forth by the Air Conditioning Contractors Association (ACCA) and the Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA). To coincide with the current T24 update process (set to go into effect in 2014), this strategy is considered a high priority for immediate implementation.

PROGRESS TO DATE (2010-2012)



Revisions to the 2013 version of T24 are well underway, and the WHPA has made recommendations to CEC on changes (detailed below) for consideration. This action is roughly 50 percent complete. Examples of progress include:

- **ACCA Quality Initiative.** Launched in 2011, the Quality Installation (QI) Specification²⁰ is an American National Standards Institute (ANSI)-approved standard that describes the steps a contractor must take to ensure a quality HVAC installation. This groundbreaking initiative is underway with support from a broad coalition of industry stakeholders.
- **SMACNA HVAC Technical Guidelines.** In 2010, SMACNA provided revised HVAC-related quality recommendations and technical guidelines to union technicians and companies, with technical information that are designed to have technical depth beyond what the ACCA quality standards cover. Selected SMACNA materials are ANSI Standard certified.
- **Title 24 Update.** The WHPA Compliance Committee provided recommendations for the 2013 T24 revision, including calls for forms simplification and automated form-filling software, to help achieve the permit compliance goals of the Strategic Plan.²¹

1-3 ACTION PLAN (2010-2012)

Milestone	Champion	Key Actions	Timeline
1-3-1 Adopt ANSI standards into Title 24; integrate into existing utility program designs	WHPA Workforce Education & Training Committee	Identify priority mandatory installation elements from ACCA and SMACNA QI/QM for equipment and system design	Complete
		Develop recommendations for changes to T24 updates	Complete
	Sheet Metal Workers' International Association Representative (SMWIA)	Present recommendation to CEC and T24 working groups	Complete
		Review CEC 45 day language; provide comments	Q3 2011
		Take necessary steps to align with ACCA and SMACNA standards; integrate into applicable IOU programs in other areas (e.g., WE&T)	Q1 2012
		Develop simplified compliance options with key stakeholders in collaboration with the CEC	Q4 2012

PRIORITIES FOR THE FUTURE (2013-2020)

- **Ensure T24 Load Calculations.** Energy load calculations are required to right-size HVAC units, ducts, and the like—and are required for permitting. While ACCA manuals J (residential) and N (commercial), outline requirements, these are complex calculations that are not always understood or verified. Worse, calculations are often skipped by contractors and ignored by building officials. Ensuring correct load

²⁰ Quality Assurance Contractor Recognition, ACCA, website last accessed May 25, 2011, <http://www.acca.org/quality>.

²¹ WHPA Compliance Committee recommendations T24 revisions, WHPA, website last accessed May 25, 2011, <http://performancealliance.org/LinkClick.aspx?fileticket=SjK4oJ2waEs%3d&tabid=200&mid=737>.

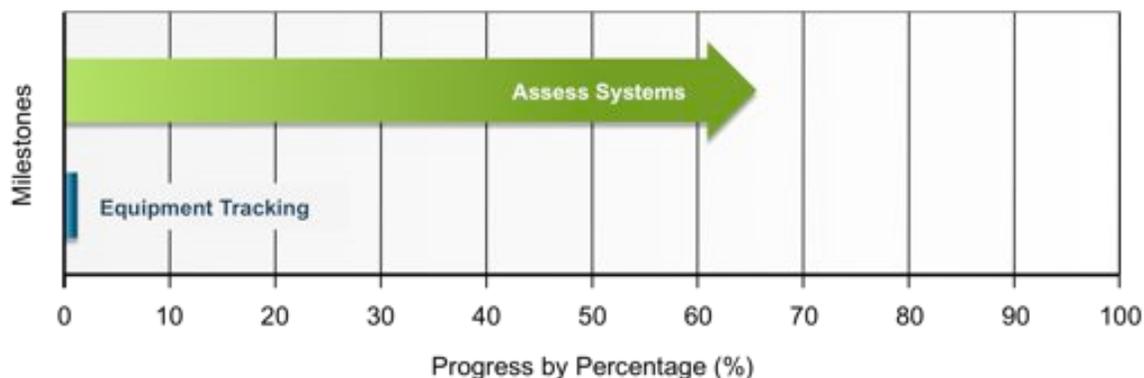
calculations *before* installation (perhaps by simplifying calculations) will help achieve HVAC’s energy efficiency potential.

- **Further Align ACCA/ANSI, SMACNA and T24 Standards.** With more focus on products than practices, T24 is lacking integration with industry-leading quality installation standards and specific quality installation measures. It unlikely that total alignment with ACCA and SMACNA standards and technical guidelines will be possible in the current T24 update process, but eventual alignment is one of California’s best hopes for improving HVAC installation and maintenance. In addition to integration in T24, workforce education and training initiatives (WE&T) should also integrate best practices from the available national standards and guidelines.

STRATEGY 1-4: DEVELOP AFFORDABLE STANDARDS AND QUALITY COMPLIANCE SOLUTIONS

While California’s HVAC-related regulations have become increasingly strict,²² the lack enforcement has resulted in significant lost opportunities for energy efficiency. Many in the industry blame the cost of compliance and the lack of affordable standards (e.g., the range of retrofit permit costs is \$2000-\$3000) for lost opportunities²³. Indeed, ranging from time spent on paperwork to fees paid, costs for installing T24-compliant HVAC measures have escalated dramatically (including the coordination of tests such as Home Energy Raters (HERS) and site visits from other inspectors).²⁴ To reverse the financial disincentives for “playing by the rules,” and achieve the goals of the Plan, issues around the affordability of bringing all HVAC installations into compliance are being addressed (leaving equipment tracking to be examined more closely in the future).

PROGRESS TO DATE (2010-2012)



With actions to access systems—including reviewing best practices of other organizations—is two-thirds complete, equipment tracking has yet to be launched. Proposals to track a serial number on an HVAC unit from the distributor to the contractor and finally to local code officials, is on hold until 2012.

²² Federal minimum standards for residential air conditioning is the Seasonal Energy Efficiency Rating (SEER) 13 but all California IOU incentives require equipment starting at SEER 14. For more information, see <http://www.13seer.org>.

²³ Mark Cherniack, personal communication, March 8, 2011.

²⁴ Don Langston and Bob Wiseman, personal communication, April 2011.

- **Efficient HVAC Permit Compliance Forms.** Several distinct compliance forms for building alterations and equipment replacement (the majority of HVAC unit installations and related duct work) requiring permits have been condensed and simplified. (Note: this includes CF 1R-ALT HVAC for Residential and MECH-1C-ALT for Commercial). The residential form was reduced by 80 percent (from 5 pages to 1), saving approximately 40 percent in administrative hours.²⁵
- **Assessment of Risk Survey.** The WHPA Compliance Committee’s “Contractor’s Assessment of Risk for Non Compliance” survey²⁶ demonstrated that contractors consider failing to take out a permit to be a negligible risk and that the consequences of working without a permit are insignificant. The WHPA is taking steps to address these issues with education and outreach.

1-4 ACTION PLAN (2010-2012)

Milestone	Champion	Key Actions	Timeline
1-4-1 Convene stakeholder group; develop details of proposed (online) systems and determine whether to proceed	Institute of Heating & Air Conditioning Industries (IHACI)	Identify key stakeholders to provide feedback on standards and compliance solutions	Complete
		Assess the necessary measures to make standards and compliance more affordable related to permit filing	Complete
		Review relevant approaches from other governments and associations	Complete
		Assess costs and benefits of alternatives; determine next steps	Complete
		Develop simplified forms to replace all required forms for the 2013 version of T24 (for simple HVAC replacements)	Q4 2012
		Develop a searchable, publically-accessible database for key compliance form detail	Q4 2012
1-4-2 Consider developing an internet-based system that tracks the status of equipment, from the initial sale to final quality check in the field	WHPA Compliance Committee WCEC Staff	Inventory needs of internet-based system to track equipment	Q1 2012
		Research equipment tracking systems; assess costs and implementation factors	Q2 2012
		Create gap analysis between needs and existing solutions	Q3 2012
		Deliver recommendation on system development to WHPA for consideration	Q4 2012

PRIORITIES FOR THE FUTURE (2013-2020)

²⁵ Bob Wiseman, personal communication, April 2011.

²⁶ “How Do Contractors Assess Risk In Doing Unpermitted Work?”, WHPA, last accessed May 25, 2011, http://performancealliance.org/LinkClick.aspx?fileticket=_4JqlzVkp00%3d&tabid=200&mid=737.

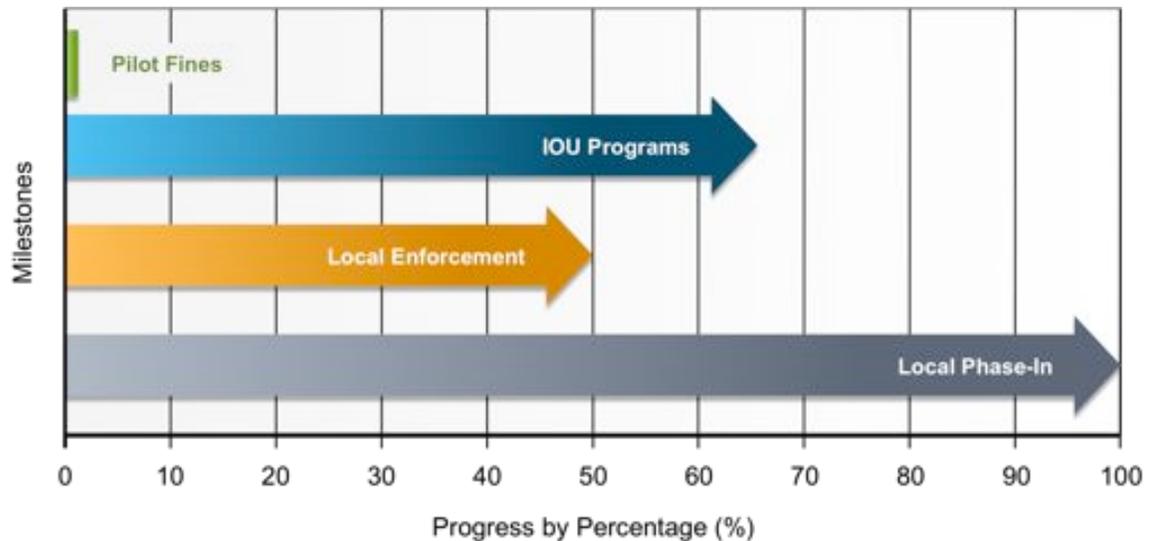
- **Simple and enforceable standards.** Based on the example of daylighting standards in T24, HVAC standards should become less complex over time (even if more stringent.) Standards must be enforceable and simple to assess (e.g., the “eyeball test”) and align with the limited time in the field that building officials have. Jurisdictions could require proof of permit and proof of insurance coverage before being allowed to sell HVAC equipment locally.
- **Searchable energy code online.** California’s Energy Code is difficult for many in the HVAC industry to use. Not only does the Energy Code lack an index, but it is not available online in a searchable format. Translating the code into HTML or web-based text with hyperlinks, would significantly increase contractor access and could increase the number of permits, and potentially improve the quality of installations.
- **Track Permit Activity.** Currently, California consumers are not required to register their equipment serial numbers with manufacturers for warranty purposes. This is a major barrier to tracking permit activity in all jurisdictions statewide; actions should be taken to (including potential legislation) changes this requirement, to add another tool to tracking and enforcement activity.

STRATEGY 1-5: ENFORCE PENALTIES FOR CONTRACTORS WHO DO NOT PULL PERMITS OR OPERATE WITHOUT THE APPROPRIATE LICENSE

While California has always had aggressive standards and regulations to manage energy load, enforcement has been lacking. The CSLB can discipline contractors without permits (including assessment of civil penalties of up to \$5,000 per citation²⁷ and/or suspension or revocation of the contractor license), but enforcement lies with local jurisdictions. Unfortunately, these same jurisdictions are facing resource and personnel shortfalls as a result of reduced tax revenues. Without sufficient enforcement, energy savings envisioned by the Strategic Plan is threatened. With so much riding on proper enforcement, this is a priority strategy for near-term implementation.

PROGRESS TO DATE (2010-2012)

²⁷ “HVAC Permit Enforcement,” CLSB, Summer 2010, <http://www.cslb.ca.gov/Newsletter/2010-Summer/page9.htm>



As shown above, great progress has been made in developing programs requiring proof of quality installations for rebates (66 percent), encouraging local enforcement (50 percent) and developing plans for mandatory phase-in of local enforcement (100 percent). Pilot testing of fines will begin in 2012. Examples of progress include:

- **Contractors State License Board (CSLB) Support.** In 2010, CSLB began accelerating its enforcement activities to ensure that new, enhanced compliance requirements are being met for T24. Results confirm that a significant fraction of contractors do not take out permits and a number of citations are being issued to these violators.²⁸
- **Local Building Officials Permit Workshops.** With the Institute of Heating and Air Conditioning Industries (IHACI), SMACNA and Home Energy Rating System (HERS) raters, California’s IOUs are alerting contractors to T24 code changes. Through training events, industry partners are sharing revised permit forms and helping to establish a credible threat for contractors working without permits or licenses.
- **Campaign Against Non-Compliance.** CSLB is working to improve enforcement, including identifying violators, issuing warning letters and citations and collecting a database of contractors “on notice.” The industry has been publicizing this stepped-up enforcement through media coverage, including articles in the *ACHR News* and California-based HVAC organization publications.
- **Permit Requirements for Incentives.** With the 2010-2012 program cycle, California’s IOUs have worked to encourage compliance by requiring proof that customers have used a licensed contractor and followed applicable permitting requirements for an HVAC installation to receive incentives.
- **Southern California Edison A/C Quality Installation (QI) Program.** Recently launched, this QI program requires contractors to be certified through SCE’s QI requirements in order to receive financial incentives for installations. To qualify, contractors must have permits, have 50 percent or more NATE-certified technicians in their company and implement the ANSI/ACCA 5 QI-2007 Quality Installation Specification for a given job.

²⁸ Bob Dresser, personal communication, December 21, 2010.

1-5 ACTION PLAN (2010-2012)

Milestone	Champion	Key Actions	Timeline
1-5-1 Pilot test local government fines in lieu of contractor license suspension	WHPA Enforcement Subcommittee	Identify project leads for research, investigation	Q1 2012
		Scope research project/investigation	Q2 2012
	David Fogt, CSLB	Conduct research; synthesize findings, recommendations	Q3 2012
		Release results of study/investigation	Q4 2012
1-5-2 Expand SMUD program to IOUs (proof of quality installation for rebate)	IOU HVAC Program Staff	Developed detailed understanding of SMUD program	Complete
		Develop a SMUD-like program implementation plan (PIP) for IOUs	Complete
		Include SMUD-like program in next program portfolio (2014-2016)	Q2 2012
1-5-3 Identify local government resources needed for enforcement	California Building Officials (CALBO) Representative	Assess the ability of local government to assist with near-term enforcement goals	Complete
		Recommend next steps for the WHPA to pursue with local governments	Complete
		Expand cooperative enforcement with CSLB, building officials, contractors and Attorney General's office.	Q3 2012
		Conduct a thorough study of permit rates over several years, and evaluate what factors affect compliance rates	Q4 2012
1-5-4 Establish action plan to phase-in mandatory enforcement	WHPA Enforcement Subcommittee	Based on local government assessment (1-5-3 above), determine need for action	Complete
		Create phase-in plan	Complete
	David Fogt, CSLB		

PRIORITIES FOR THE FUTURE (2013-2020)

- **Create credible threat for noncompliance.** Today, compliance is left to over-burdened and underfunded local governments; attention by consumers must be drawn to the actual downsides of noncompliance. In addition, data and research on the effect of enforcement is a critical need to the successful implementation of the Strategic Plan.
- **Consider direct-to-owner rebates.** Given the role that consumers play—and will increasingly play—in ensuring compliance and quality installation, expanding existing programs that require contractors to provide proof of permits in order to receive rebates to involved homeowners should be considered. In

addition to providing a more direct incentive to building owners themselves, a direct HVAC rebate program could be a powerful educational tool.

- **HVAC Specialty License.** Discussions at the WHPA Compliance Committee indicated interest within the CSLB in exploring the option of a special license for HVAC contracting work that would require advanced training leading to higher level technical and customer education proficiency. Training would include the range of quality installation and maintenance approaches.

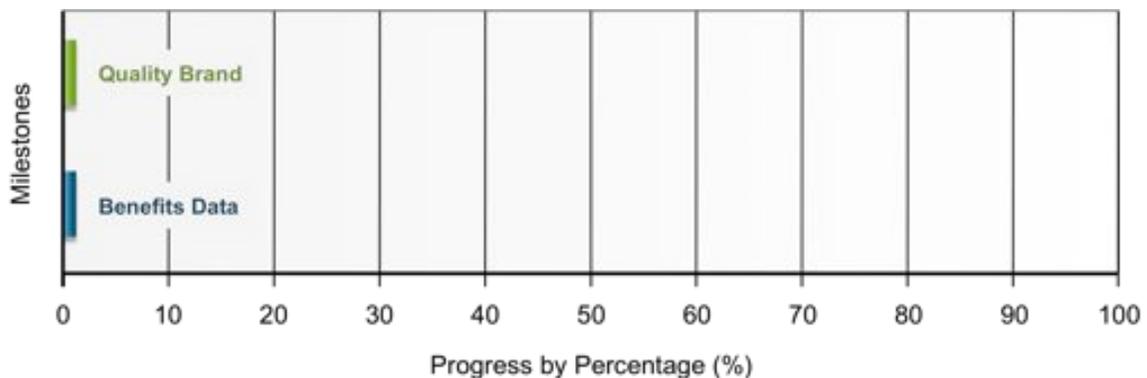
GOAL 2: QUALITY HVAC INSTALLATION AND MAINTENANCE

The following strategies are focused on Goal 2: “Quality HVAC installation and maintenance becomes the norm. The marketplace understands and values the performance benefits of quality installation and maintenance.”

STRATEGY 2-1: CREATE A STATEWIDE QUALITY INSTALLATION AND MAINTENANCE (QI/QM) BRAND THAT WILL BE ATTACHED TO SYSTEMS/INSTALLATIONS/ CONTRACTORS THAT MEET QUALITY STANDARDS

Because it is difficult for the layperson to identify what a quality HVAC installation looks like, the Strategic Plan introduced specific milestones to improve the customer’s ability to identify, procure and verify quality installation. The complex process of developing an effective brand that resonates with California consumers—including the development of brand attributes, as well as “look-and-feel” of a logo—begins with a review of the building energy efficiency standards to precisely define QI/QM (including a clear accounting of HVAC lifecycle costs and benefits, such as price, longevity and performance), translated for broader public consumption. With a foundation of the branding approach set in a clear definition, mission and purpose, California must develop statewide guidelines and standards that allow logo use only with verified projects that meet QI/QM standards—or risk challenges to brand value. Given the time and expertise required, this strategy requires near-term focus, including initiation of a WPHA marketing committee and market adoption subcommittee.

PROGRESS TO DATE (2010-2012)



As noted above, activities are just now launching on the development of a QI/QM brand. While limited progress has been tracked to date on both the development of the quality brand and collection of data, advancement of these efforts is expected in 2011-2012.

- **Western HVAC Performance Alliance (WPHA) Marketing Committee.** The Marketing Committee of the WPHA is initiating a look at the overall needs for a statewide branding initiative including tools

such as branding guidelines and procedures. The committee is applying learnings from SCE's existing A/C Quality program and brand.²⁹

- **ENERGY STAR QI.** This national effort provides guidelines for residential HVAC systems and is based on the ANSI/ASHRAE/ACCA Standard 5 QI-2010 *HVAC Quality HVAC Installation Specification*.³⁰ ACCA, ENERGY STAR and Residential Energy Services Network (RESNET) are collaborating across several QI/QM efforts in the residential sector.
- **QM Program for Rooftop Units.** SCE is assessing the energy savings benefits through measured field study of commercial rooftop units; the economic benefits of this quality approach will be integral to building a statewide quality brand. With the assessment to be completed by 2010, the results will inform development of HVAC incentives and marketing programs.

2-1 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
2-1-1 Create and launch statewide quality brand and/or align with national brand	HVAC Manufacturers	Agree to standards of quality maintenance and key attributes of brand	Q3 2011
	HVAC Contractors Associations	Assess existing brands for alignment opportunities	Q3 2011
	Labor Unions	Develop brand guidelines and marketing campaign	Q4 2011
	WHPA Marketing Committee	Launch campaign	Q1 2012
2-1-2 Develop operating and lifecycle data on economic and comfort benefits	IOU HVAC Program Staff	Assess existing operating and lifecycle data on economic and comfort benefits of quality HVAC installations	Q3 2011
		Identify gaps in current data	Q3 2011
		Create work plan to fill data gaps	Q4 2011

PRIORITIES FOR THE FUTURE (2013-2020)

- **Brand management.** To protect the value of the QI/QM brand and being able to create predictable results from HVAC systems bearing the label, California must police use of the brand. Controlling against brand dilution requires both a policing mechanism and legal ramifications for inappropriate use.
- **Test and track brand value.** To ensure that branding efforts are achieving the desired results with consumers, focus group testing with key segments must be scheduled at regular intervals. Tests should include consumers as well as contractors. Value assessments should also take into consideration any logo confusion or brand devaluation from co-marketing.

²⁹ AC-Quality is Southern California Edison's branded quality HVAC installation program for homeowners and contractors. For more information, see <http://www.ac-quality.com/>.

³⁰ "The ACCA Standard 5 HVAC Quality Installation Specification," ACCA, last accessed May 24, 2011, <https://www.acca.org/Files/?id=693>

- **Incorporate maintenance study findings.** The HVAC Energy Efficiency Maintenance Study detailed a number of areas for improving QM field practice via utility-sponsored QM programs for customers. Following up on findings—addressing complex human factors and fine-tuning measurement and verification approaches—will help achieve Plan goals.

STRATEGY 2-2: LAUNCH A CONSUMER MARKETING AND EDUCATION CAMPAIGN TO SUPPORT THE BRAND AND STIMULATE MARKET DEMAND

The HVAC goals for the Strategic Plan will not be successful unless consumers become “constituents” of the Plan, and are both educated and motivated to verify the quality of their HVAC installations. Regulations alone (e.g., Title 24) are not enough to achieve the goals of the Strategic Plan. Today, it is nearly impossible for most HVAC customers to assess the quality of services and products purchased. To truly transform HVAC, consumers must be able to quickly identify quality providers and products that are right for their climate today, and ensure long-term energy savings. Following the development of a QI/QM brand (targeted for 2011), a campaign—segmented for key markets—will be launched to ensure brand proliferation and use (ideally in 2012).

2-2 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
2-2-1 Develop and launch campaign	TBD	Identify key bodies to reach targets	Q1 2012
		Develop high-leverage campaign strategy to secure commitments	Q1 2012
		Secure campaign funding	Q1 2012
		Launch campaign via key associations and targeted media	Q2 2012

STRATEGY 2-3: DEVELOP AND PROVIDE EXPANDED QI/QM TRAINING FOR CONTRACTORS, TECHNICIANS AND SALES AGENTS

According to the U.S. Bureau of Labor Statistics, the number of HVAC (and refrigeration) jobs will grow by 29 percent between 2008 and 2014. In addition, 27,000 skilled HVAC workers retire every year³¹—begging the need for more robust and consistent training to meet market demand for contractors. California HVAC contractor licensing is usually conducted at the “company” level, not the individual technician or installer level—leaving many front-line technicians untrained, uncertified and unaware of the critical need to get installation details right. Enhanced QI/QM education and training of the entire HVAC

³¹ CEC (2008) p. 19

value chain—including quality as company culture for business owners, best practices for installers and instruction on how to pitch higher quality jobs for sales training—is necessary to achieve the Strategic Plan’s energy efficiency market transformation goals. To best leverage resources, this strategy is launching in 2011 and will build on the statewide workforce education and training needs assessment.³²

PROGRESS TO DATE (2010-2012)



In concert with the workforce education and training (WE&T) needs assessment published in March of 2011, progress has been made specific to HVAC training needs. With approximately 50 percent of activities completed, advancement on this strategy to date includes:

- **WHPA Workforce Education & Training (WE&T) Committee.** The WHPA has launched a workforce training committee to address the goals of the Strategic Plan. This effort will leverage the results of the statewide WE&T needs assessment and develop a path to success for the HVAC industry to meet the needs of California’s growing demand for quality installation and management.
- **QI/QM Training Programs.** In the IOUs’ 2010-2012 portfolios, contractor certification is now required in order to participate in rebate and incentive programs. A partnership between SCE, SDG&E and the Institute of Heating & Air Conditioning Industries (IHACI), resulted in 15,000 technical trainees in 2010. Training aimed at proficiency in in-field best practices needs to be a primary driver for certification.
- **AirCare Plus.**³³ New to the 2010-2012 program cycle, PG&E offers the AirCare Plus program that includes training, tools, quality control and incentives. The program works through HVAC contractors to deliver services to customers by providing advanced technical training for technicians to optimize the efficiency of existing commercial rooftop units.

³² “California Workforce Education and Training Needs Assessment,” the Donald Vial Center on Employment in the Green Economy, March 17, 2011, <http://www.irl.berkeley.edu/vial/>.

³³ For more information on the AirCare Plus HVAC maintenance program, visit www.aircare-plus.com.

2-3 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
2-3-1 Conduct comprehensive training needs assessment to identify industry skill gaps; begin expanded training programs	IOU HVAC Program Staff	Participate in general workforce education and training (WE&T) needs assessment	Complete
	IOU Education & Training Staff	Review WE&T needs assessment; determine gaps	Complete
		Create request for proposal (RFP) for HVAC-specific needs assessment	Complete
		Launch needs assessment to identify industry skill gaps	Q3 2011
		Review assessment; develop training program to address gaps	Q4 2011
		Launch expanded, ongoing training programs	Q4 2012

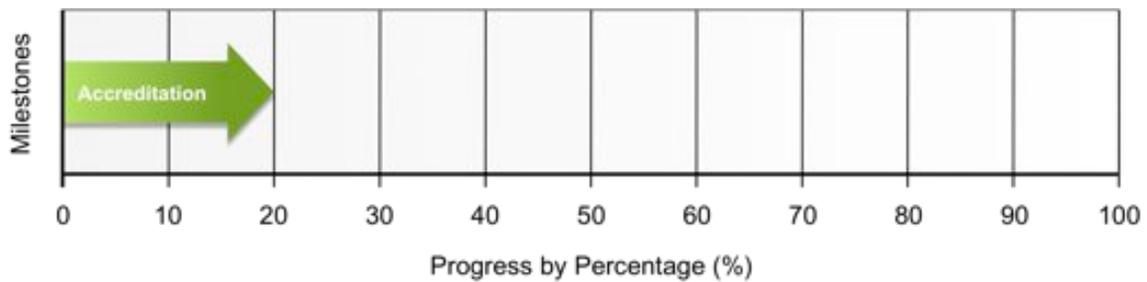
PRIORITIES FOR THE FUTURE (2013-2020)

- **Revisit quality standards regularly.** HVAC is a dynamic industry and QI/QM standards must be revisited on a regular basis. Additional kinds of training may be needed due to changing products and circumstances. In addition, advances in electronic technology and diagnostic tools will change the training disciplines necessary to perform services associated with the standards.
- **Knowledge retention and application.** The key to achieving the industry transformation envisioned by the Strategic Plan, is to ensure that the principles taught in the QI/QM training programs are applied by technicians in their daily work. Methods to measure retention of technical knowledge and assess use in the field must be developed to gauge success and enhance training programs.

STRATEGY 2-4: DEVELOP AND IMPLEMENT COMPREHENSIVE CONTRACTOR ACCREDITATION PROGRAM

Contractor accreditation and certification secured through training programs helps realize all cost effective energy savings in the HVAC industry. A preliminary study of utility bills by North America of Technician Excellence (NATE) shows that certified installers and technicians achieve more energy efficiency than work completed by non-certified individuals. Unfortunately, even the best of contractor accreditation programs—essential to the Strategic Plan—are largely designed for the residential market and overemphasize product-based approaches (e.g., selling higher SEER-rated goods) versus system-based performance. In the ideals of the Strategic Plan, all technicians and installers will obtain relevant certification by the end of 2020 in order to get an HVAC contractor license. Each of the 20 available accreditation programs offered in California vary in terms of the quality and depth of the training content. While some progress has been made on this strategy, 2011 and 2012 will see a greater focus on comprehensive contractor accreditations with increased emphasis on proficiency for best practice in the field.

PROGRESS TO DATE (2010-2012)



While there is still much progress to be made, initial efforts to assess accreditation programs have positioned this milestone at 20 percent complete. Examples of progress include:

- **Certification prerequisite for incentives.** SCE has offered a program since 2009 that requires that contractors have at least 50 percent of their technicians certified by NATE to receive incentives.
- **ACCA Quality Assured (QA) Contractor.**³⁴ Within the last year, ACCA launched a QA program that requires adherence to a range of ACCA quality standards and verification protocols. The program meets the ENERGY STAR Qualified Homes National Program requirements, which includes 3rd party inspection of jobs. RESNET is collaborating on the inspection component.
- **Census of HVAC Related Organizations.** Lists of national and California-based public and private school training programs, contractor associations, certification programs and end-user associations are now posted and updated on the WHPA website.
- **Workforce Needs Assessment.** In March 2011, “California Workforce Education and Training Needs Assessment for Energy Efficiency, Demand Response, and Distributed Generation” was released by the UC/Berkeley Institute for Research on Labor and Employment.³⁵ Needs identified included more stringent contractor licensing, increased training for existing workers in the building envelope construction trades and focusing educational investment from ratepayer dollars on stable firms.

³⁴ “Quality Assured Contractors,” ACCA, last accessed May 24, 2011, <https://www.acca.org/industry/quality/quality-assured>.

³⁵ Donald Vial Center on Employment in the Green Economy, March 17, 2011, p. xxv.

2-4 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
2-4-1 Develop accreditation program requirements; begin implementation	IOU HVAC Program Staff	Inventory HVAC training programs nationally and in California	Complete
		Assess current accreditation programs; identify priority programs	Q3 2011
	SMWIA Representative	Develop pilot activities to advance specific accreditation for California	Q4 2011
		Run pilot program with community colleges, trade schools and energy centers	Q4 2011
		Assess results from pilot; recommend programs for 2014-2016 program IOU cycle ³⁶	Q1 2012

PRIORITIES FOR THE FUTURE (2013-2020)

- **Investigate energy savings for training.** A regulatory mechanism to credit utility education and training programs with energy savings could help expand HVAC training for licensed contractors for salespeople and building departments.
- **Web-based resources.** Consumers and contractors alike should increasingly leverage www.engage360.com (ratepayer-funded website dedicated to energy efficiency information exchange) to share information about HVAC companies and certified technicians. In addition to providing qualified contractors with leads, online resources can help consumers become more knowledgeable about (and likely to use) well-trained HVAC professionals.
- **Create joint HVAC and whole building design programs.** As the Strategic Plan shifts California to an integrated systems design approach, there is a greater need to integrate builders with mechanical engineers, architects and designers with facility managers. Specific cross-training opportunities need to be developed and promoted.
- **Expand HVAC knowledge base.** HVAC fundamentals need to be included in science curriculum potentially starting as early as 7th grade. Relationships need to be established between trade/vocational HVAC programs and university mechanical engineering programs with practical, in field hands on experience part of the higher education curriculum. The California State Department of Education should be formally brought into conversations about future initiatives.
- **Update and upgrade the HVAC skill base.** As commercial HVAC equipment becomes more sophisticated (including ductless systems and radiant cooling) to address the goals of the Strategic Plan, workforce skills must keep pace. Commercial sector contractor training and accreditation development must expand alongside advanced technology and integrated design.

³⁶ The IOU energy efficiency program cycle is currently 2010-2012, to be followed by another three year program cycle. However 1-2 year bridge funding is being considered, potentially pushing the next program cycle into 2014-2016.

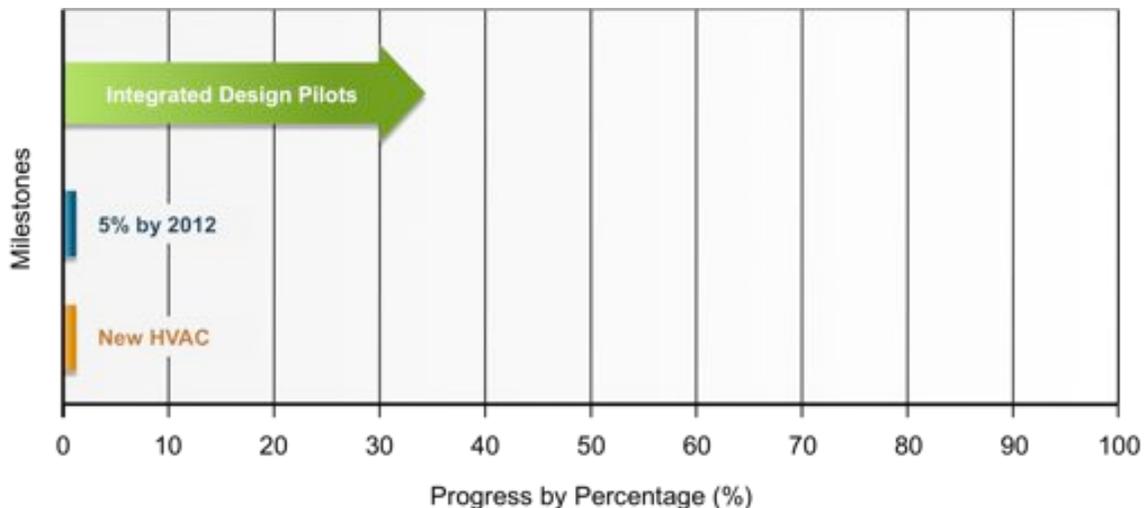
GOAL 3: WHOLE BUILDING DESIGN

The following strategies are focused on Goal 3: “Building industry design and construction practices that fully integrate building performance to reduce cooling and heating loads.”

STRATEGY 3-1: AGGRESSIVELY PROMOTE WHOLE BUILDING DESIGN CONCEPTS THAT IMPROVE THE OVERALL THERMAL INTEGRITY OF NEW AND EXISTING STRUCTURES

Air conditioning does not work in isolation; buildings themselves dictate the occupant’s experience of comfort and efficiency. Whole building design that integrates thermal integrity is essential to achieve all potential energy savings identified in the Strategic Plan. While HVAC has historically been treated as a “box” or a “widget,” national organizations such as ACCA (Air Conditioning Contractors of America), ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers), BPI (Building Performance Institute), SMACNA and EPA’s ENERGY STAR Buildings Program have also begun to elevate the importance of right-sizing and proper control of HVAC equipment, which are key to successful integrated building designs and performance. To maximize the effectiveness of the systems approach in many 2010-2012 IOU programs, support for whole building design concepts has been a priority since 2010.

PROGRESS TO DATE (2010-2012)



While progress has been made on integrated design pilots (33 percent) as part of ongoing implementation in the 2010-2012 timeframe, much remains to be done to incorporate whole building design concepts to boost thermal integrity and to work with CEC and IOU priorities (both at zero percent). Examples of progress of pilots includes:

- **Energy Upgrade California (EUC).**³⁷ The largest “home as a system” retrofit program in the U.S., EUC promotes statewide, key elements of whole building design integration, including attic air

³⁷ “Choosing Your Upgrade Package,” last accessed March 20, 2011, www.EnergyUpgradeCA.org.

sealing, high efficiency furnaces, efficient windows and cool roofs. Financial incentives are offered for different tiers of efficiency measures, but with emphasis on the value of choosing more comprehensive tiers for greater energy savings.

- **Savings by Design (SBD).** The IOUs and SMUD offer SBD incentives for customized new commercial construction projects that exceed T24. These programs target the primary decision-makers (e.g., building owners, developers, architects) and include design assistance, design team incentives, end-use monitoring and financial incentives including online training courses.³⁸ In 2010, SBD started pushing for designs that were 30-40 percent more efficient than 2008 Title 24.
- **Commercial Building Zero Net Energy Program.** In 2010, Pacific Gas & Electric (PG&E) began implementing its commercial buildings zero net energy program that provide detailed assistance to design teams including the development of new design tools to support design integration, technical market assessment analyses, and outreach, education and information to the market. Performance monitoring of projects is included to provide proof of the benefits and to guide program direction.
- **Residential Building Zero Net Energy Program.** In 2010, Southern California Edison (SCE) broke ground on the Zero Net Energy Technology Test Center. The first ZNE lab of its kind, the center is designed to allow different types of building shell, interior, HVAC and electrical systems to be removed and replaced with different types of systems, renewable energy sources and demand management options to find optimal design for ultra low energy use.

³⁸ “Energy Design Resources,” GeoPraxis, last accessed May 24, 2011, <http://www.energydesignresources.com/>.

3-1 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
3-1-1 Pilot targeted programs	IOU Whole House Team	Launch pilot programs (whole house, quality installation [QI/QM], emerging technologies)	Ongoing
		Evaluate pilot programs (including field testing)	Ongoing
		Recommend program revisions as necessary for success in next program cycle (2014-2016)	Q2 2012
3-1-2 Incorporate radiant cooling, ductless systems, ground source heat pumps, and other alternatives into 5 percent of new and existing construction by 2012	IOU Whole House Team	Identify options for prioritizing technologies and appropriate applications	Q3 2011
		Identify programs (e.g., whole house, zero net energy, Savings By Design) that can utilize HVAC whole building design	Q3 2011
		Gather quantitative and qualitative data on 5 percent target	Q4 2011
		Distribute results/case studies broadly to public and private sectors	Q3 2012
		Leverage IOU programs to bring HVAC whole building design to 5 percent of new and existing construction	Q4 2012
3-1-3 Identify priorities of CEC PIER and IOU emerging technologies program activities to further support newer HVAC technologies and systems	WHPA Advanced Technology Committee	Identify key HVAC programs and research bodies to track, including U.S. Department of Energy (DOE)	Q3 2011
	WCEC Staff	Inventory what activities are underway for "newer HVAC technologies"	Q3 2011
	Chris Scruton, CEC/PIER	Align with national regulatory activity related to raising minimum Seasonal Energy Efficiency Ratio (SEER)	Q3 2011
		Share updates quarterly	Q4 2011

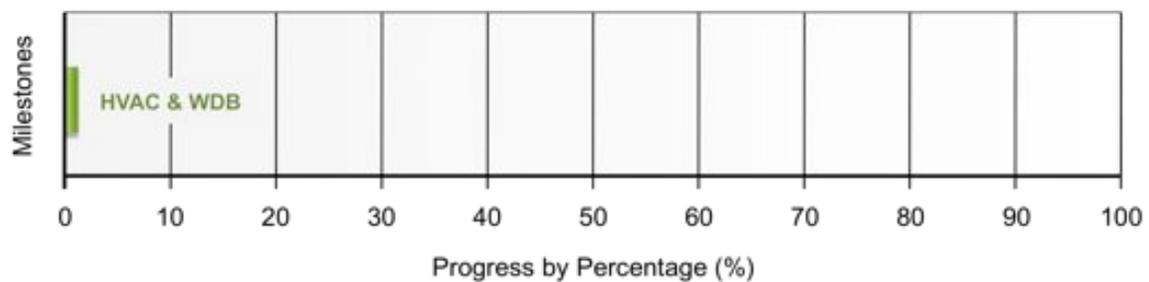
PRIORITIES FOR THE FUTURE (2013-2020)

- **Expand commercial rooftop unit alternatives.** Technologies including ductless variable refrigerant flow equipment, advanced evaporative hybrid units, evaporative condenser pre-cooling retrofits and thermal energy storage systems can be coupled with rooftop units for significant peak demand reduction. Further assessment of technology options for commercial rooftop units is needed, and suppliers and utilities will need to collaborate to increase market knowledge of these alternatives.
- **Engage the private sector.** The private sector always needs answers as to the suitability, quality, costs, operating life and maintainability of new energy products. Key organizations (e.g., IOUs, CEC) should actively partner with equipment producers to ensure that useful information is provided in a timely manner to the market, and supported with specialized workforce training as needed.

STRATEGY 3-2: ACCELERATE ACTIVITIES RELATED TO HVAC ASPECTS OF WHOLE BUILDING INDUSTRY DESIGN STANDARDS

Many milestones in the Strategic Plan focus on changes to Title 24 (T24) and Title 20 (T20)—California’s building codes and appliance standards. However, the specific HVAC aspects of a systems approach—including system concept, load calculations, system location, air distribution, equipment selection and duct size calculations—are only possible if HVAC is appropriately integrated during the design phase. This strategy can more quickly highlight HVAC’s role in the design phase by leveraging industry leadership organizations and working to publicize high-profile results. These efforts will ramp up by 2012, to leverage results of pilot efforts with IOU programs to aggressively promote whole building design.

PROGRESS TO DATE (2010-2012)



While a vital element of success in the HVAC Action Plan, advancement on working with rating systems is just beginning and is currently at zero percent. While more advancement is expected in the next year, a few important examples of progress include:

- **RESNET EnergySmart Training.**³⁹ Launched within the last year, RESNET teaches contractors and builders to complete comprehensive energy efficient retrofits—including properly sizing HVAC systems. RESNET emphasizes the house and the HVAC equipment as an integrated whole system and requires continuing education.
- **California Senate Bill 758.**⁴⁰ In response to this 2009 legislation, the CEC is supporting the development of a Comprehensive Energy Efficiency Program for Existing Buildings to get deeper savings from comprehensive retrofits in existing commercial and residential buildings. A critical component of the program is a properly sized and controlled HVAC system that exceeds T24 minimum efficiency requirements.

³⁹ RESNET EnergySmart Contractor program, RESNET, last accessed May 24, 2011, <http://www.resnet.us/energysmart-contractor>.

⁴⁰ California Senate Bill 758 Comprehensive Energy Efficiency Program for Existing Buildings, California Senate, February 2009, <http://www.energy.ca.gov/ab758/index.html>.

3-2 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
3-2-1 Evaluate and update existing standards to include increased emphasis on HVAC aspects of whole building approaches	WHPA Committee on Standards Integration	Inventory existing whole building industry standards	Q3 2011
		Assess the role of HVAC aspects of whole building approaches	Q3 2011
	IOU HVAC Program Staff	Identify gaps and opportunities to advance HVAC aspects	Q4 2011
		Approach key industry groups to change standards and elevate HVAC aspects	Q1 2012

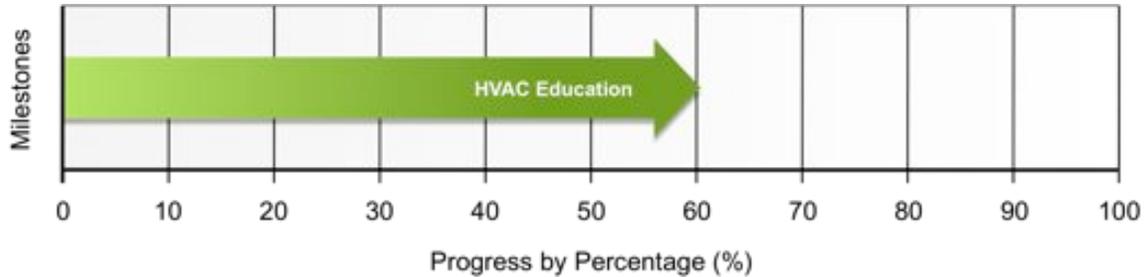
PRIORITIES FOR THE FUTURE (2013-2030)

- Elevate HVAC with rating systems.** Even though it accounts for a majority energy use in many buildings, HVAC is too often addressed long after decisions about early design considerations—including load-bearing structures and ventilation requirements—are resolved. Leveraging the energy criteria of rating systems such as Leadership in Energy and Environmental Design (LEED) is a way to approach architects and engineers to keep HVAC from becoming an afterthought.
- Outreach to project engineers and custom builders.** Project engineers and structural engineers must focus on HVAC design and integration early in the design process. While structural engineering affect the “veins” of the systems, the project engineer is a crucial element to advanced HVAC-inclusive whole building design.

STRATEGY 3-3: ACCELERATE HVAC RELATED ASPECTS OF WHOLE BUILDING DESIGN IN THE EDUCATIONAL AND PROFESSIONAL COMMUNITIES

Just as HVAC’s role must be more aggressively promoted in both voluntary standards (Strategy 3-2) and statewide programs (Strategy 3-1) via the Plan, California must expand the understanding and application of whole building design with the state’s traditional HVAC training schools. These training channels include the community colleges and trade schools, industry online education, credentialing programs and unions including the Sheet Metal and Air Conditioning Contractors’ National Association and the Sheet Metal Workers International Association. Although all of the education and training programs recognize the importance of integrated design, not all programs offer comprehensive integrated design content along with the primary HVAC curriculum. In order to prevent lost opportunities and help realized all savings available, expanding HVAC’s role in whole building design is a priority strategy.

PROGRESS TO DATE (2010-2012)



With much of this strategy’s work moving forward as part of ongoing efforts, the completion of identifying institutions in California with HVAC educational curriculum pushes this milestone to approximately 60 percent completion.

- **The California Workforce Investment Board and its Green Collar Jobs Council.** Thanks to California’s “green collar” jobs efforts, community colleges statewide offer a growing number of programs in green building and energy efficiency in addition to the traditional curriculum.⁴¹
- **HVAC Training and Certification Programs.** There is an array of public and private HVAC training programs offered to interested participants and contractors in California and through national organizations. In southern California alone, 24 community colleges offer HVAC training programs. Private institutions, some state-based and some nationally-based, are open for enrollment year round for both individual and contractor training.⁴²

3-3 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
3-3-1 Develop continuing education programs Begin curriculum use	WHPA Committee on HVAC Acceleration	Identify educational and other training institutions/organizations (public, private) for HVAC whole building curriculum	Complete
	IOU Education & Training Staff SMWIA Representative	Assess HVAC and whole building education in existing curriculum	Ongoing
		Identify gaps in existing curriculum and HVAC whole building design instruction	Ongoing
		Revise curriculum to more accurately reflect HVAC role in whole building	Ongoing
		Expand curriculum to target schools and other training institutions/organizations	Ongoing

⁴¹ Green Collar Jobs Council, California Workforce Investment Board, last accessed May 24, 2011, http://www.cwib.ca.gov/special_committees/green_collar_jobs_council.

⁴² “HVAC Schools,” WHPA, last accessed May 24, 2011, <http://www.performancealliance.org/HVACIndustryInformation/tabid/215/Default.aspx>.

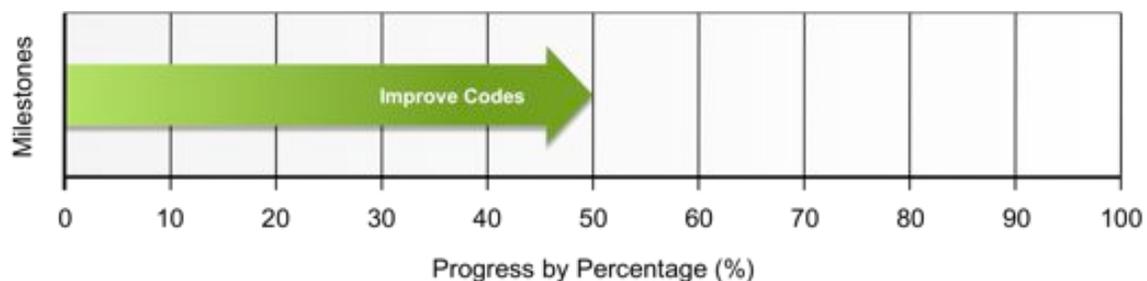
PRIORITIES FOR THE FUTURE (2013-2020)

- **Partnership development.** Trade associations and industry groups are essential to expanding whole building design knowledge. The right marketing and education partnerships will ensure speed, depth and accuracy of training information. WHPA members are integral to partnership development and will be developing recommendations on priority activities to pursue.

STRATEGY 3-4: ACCELERATE CODE-BASED SOLUTIONS TO IMPROVING THE THERMAL STRUCTURAL INTEGRITY AND INCORPORATING ALTERNATIVE COOLING METHODS INTO BUILDING DESIGNS

The whole building approach stressed in the Strategic Plan improves the thermal integrity of structures (e.g., building envelope), addresses lighting and appliance loads, moves ducts and equipment off the roof and out of hot attics (or eliminates the need for ducts with radiant heating or cooling).⁴³ In market diffusion theory, code-based solutions—such as a requirement to incorporate radiant heating and cooling and ground source heat-pumps in all new construction—are designed to address both the late majority and laggards in the building industry, left unmotivated by the first-mover incentives (both financial and otherwise) that inspire innovators and early adopters. However, California’s building energy codes (T24) are updated approximately every three years—which leaves reach codes as the main path to accelerate code-based solutions related to whole building design. The WHPA, through its committees, is involved in current efforts to update the new T24 base code that will go into effect in January 2014.

PROGRESS TO DATE (2010-2012)



With approximately 50 percent progress towards improving codes to advance alternative cooling methods, California is well on the way towards achieving the near-term milestones of this strategy. A few examples include:

- **2010 California Green Building Standards Code CALGreen.**⁴⁴ CALGreen incorporates three levels of energy efficiency for public and private sector commercial buildings: a basic level of T24, 15 percent and 30 percent over T24. Cities and counties may adopt one of the three levels (reach codes) as part of their local codes process. These new tiers above the base code are also labeled as ‘reach’ codes.

⁴³ CEC (2008) pg. 27

⁴⁴ CALGreen, California Building Standards Commission, last accessed May 25, 2011, <http://www.bsc.ca.gov/CALGreen/default.htm>

- **Reach Codes.** Several cities and counties have adopted reach codes that are more stringent than the statewide T24 minimum code and can be adopted through local ordinances. These local ordinances are providing lessons and best practices as the state moves toward more progressive codes. Cities that have adopted reach codes include: Redwood City, Los Altos, Marin, San Rafael, Union City, Morgan Hill, Richmond, Palo Alto, Chula Vista, Santa Clara, San Jose, Sonoma, Hayward, and San Francisco.⁴⁵

3-4 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
3-4-1 Implement optional code improvements necessary to facilitate moves to whole building design approaches	WHPA Committee on Code-based Solutions	Develop green building code with multiple voluntary levels; Part 11 of Title 24 (California Green Building Standards)	Complete
		Develop a reach energy code that cities can adopt or utilities can incent beyond Title 24; Part 6 of Title 24	Complete
	Eurlyne Geiszler, CEC Codes & Standards Staff	Review HVAC role in current reach codes; develop roadmap	Q4 2012
		Further develop HVAC in next reach codes	Q4 2012

PRIORITIES FOR THE FUTURE (2013-2020)

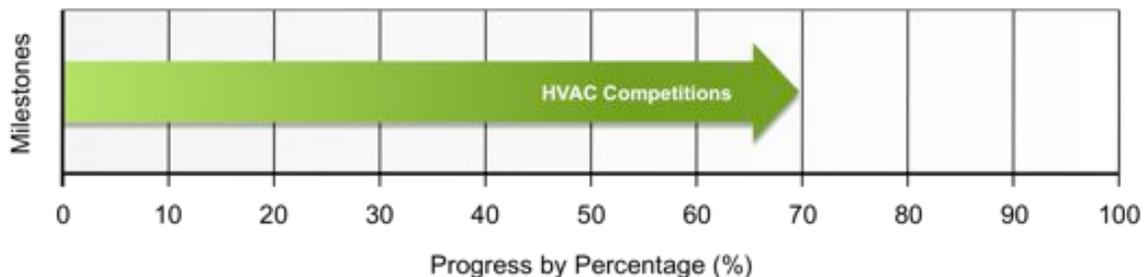
- **Coordinate with Residential and Commercial ZNE.** To ensure integration and leverage success, HVAC efforts in whole building design must be consistent with efforts in both the commercial (the Zero Net Energy Action Plan) and residential sectors (through Energy Upgrade California).
- **Performance Monitoring.** Regardless of the level of HVAC efficiency recommended or required, measuring performance of building and system energy use is the only credible method of knowing what level of energy performance is being reached. (Note: Commercial building energy measurement requirements are under review for potential submission in the 2013 T24 revisions currently underway.)
- **Outcome-Based Approaches.** While CALGreen specifies levels of increased efficiency, it does not prescribe how energy savings should be realized. In this outcome-based approach, building designers simply demonstrate how goals are achieved using an Alternative Calculation Method approved by the CEC. If the CEC continues to develop codes that focus on performance outcome rather than relying on prescriptive requirements, the state can advance integrated design that rely on the appropriate matching of building components including HVAC systems.

⁴⁵ CEC, *Local Ordinances Exceeding the 2008 Building Energy Efficiency Standards* (last viewed Aug 2010): www.energy.ca.gov/title24/2008standards/ordinances

STRATEGY 3-5: SPONSOR DESIGN COMPETITIONS TO ENCOURAGE BUILDERS TO DESIGN AND BUILD HOMES WITH NET ZERO PEAK DEMAND

In many chapters of the Strategic Plan, competition and challenges are called for as tools to encourage leadership and innovation. As noted in the CEC’s staff report, the HVAC industry seeks to “design competitions help spur builder interest and...could help identify or test which ideas are most likely to gain home buyer acceptance.”⁴⁶ In addition, competitions, such as the Western Cooling Challenge described below, can provide additional pathways to reach out to original equipment manufacturers (OEMs), not only to develop new equipment, also to support incubation of new technologies and encourage manufacturers to commercialize equipment. With innovation an essential component of Strategic Plan success, efforts to leverage competitions and prizes to encourage ZNE peak homes have been pursued since before 2010.

PROGRESS TO DATE (2010-2012)



With this strategy largely focused on the WCEC cooling challenge, progress is at roughly 70 percent. Detail follows:

- **Western Cooling Challenge.**⁴⁷ Launched in June 2008, the WCEC Western Cooling Challenge is a program designed to stimulate HVAC manufacturers to meet light commercial cooling needs in hot dry climates. The 5-ton hybrid (indirect evaporative/direct expansion) unit, the Coolerado H80, has been certified in the Challenge through NREL testing that showed an 80 percent reduction in energy (kWh) use and 60 percent reduction in peak demand (kW). California utilities are planning a scaled field demonstration of this unit.

⁴⁶ CEC (2008) pg. 10

⁴⁷ Western Cooling Challenge, UC Davis Western Cooling Efficiency Center, last accessed May 24, 2011, <http://wcec.ucdavis.edu/content/view/92/110/>.

3-5 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
3-5-1 Conduct first competition in 2010 and annually thereafter	WHPA Committee on Design Competitions	Develop entry form, rules and procedures for competition	Complete
		Launch first call for entries	Complete
	WCEC Staff	National Lab testing (NREL, Oakridge)	Ongoing
		Field tests of winning technologies (Coolerado testing)	Ongoing
		Work with OEMs and entrepreneurs to encourage additional entries	Ongoing

PRIORITIES FOR THE FUTURE (2013-2030)

- **Integrate HVAC with other design competitions.** Several energy efficiency competition programs exist, both in California (e.g., ZNE pilot programs) and nationally. The Cooling Challenge and its goals can gain traction more quickly through partnerships and potentially expanding HVAC in other competitions.
- **Expand Commercialization.** In coordination with Goal 4's focus on advanced technologies, the Cooling Challenge should work with the IOU's Technology Research Incubator Program (TRIO) and other incubators to help encourage market expansion.⁴⁸

⁴⁸Technology Research Incubator Outreach Program (TRIO), SCE, last accessed May 24, 2011, <http://www.sce.com/b-db/trio/default.htm>.

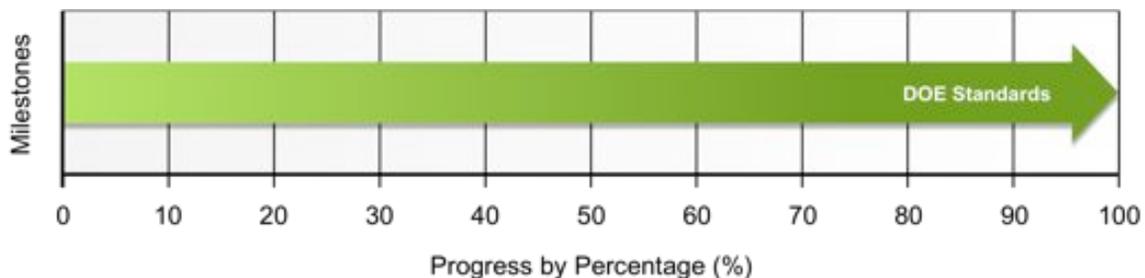
GOAL 4: NEW HVAC TECHNOLOGIES AND SYSTEM DIAGNOSTICS

The following strategies are focused on Goal 4: “New climate-appropriate HVAC technologies (equipment and controls, including system diagnostics) are developed with accelerated marketplace penetration.”

STRATEGY 4-1: PURSUE REGIONAL CLIMATE OPTIMIZED EQUIPMENT STANDARDS THROUGH DOE RULEMAKING PROCESS

Both noted in the Strategic Plan and an important part of the expansion of a smart grid system, HVAC systems must not only become more intelligent, but also must be more climate responsive. Research on climate optimized air conditioning for California sponsored by the CEC, has confirmed the benefits of equipment designed and/specified to perform more efficiently in hotter drier areas in the western United States. The federal Energy Independence and Security Act of 2007 allowed the US Secretary of Energy to consider the potential benefits of establishing climate optimized residential heating and cooling standards that exceed the national uniform minimum efficiency levels set by the US DOE. The national minimum efficiency levels cannot be legally exceeded in state and local building energy codes. The federal rulemaking proceeding is underway with a final rule to be issued June 30, 2011.

PROGRESS TO DATE (2010-2012)



Given completion of the national consensus agreement, this strategy is considered complete. Details below.

- **National Consensus Agreement.**⁴⁹ Finalized in 2009, the agreement creates opportunities for the development of climate zone-optimized HVAC products. In California, the agreement allows T24 to set a SEER 14 minimum standard for retrofit HVAC systems. A maximum SEER 15 is allowed in T24 for new construction and upsizing in performance-based codes. Both SEER levels exceed the current SEER 13 national efficiency standard that all states and local jurisdictions must adhere to. The new standards come into effect in 2016 and will be “locked” into place from 2016-2022.

⁴⁹ “American Council for an Energy Efficient Economy Fact Sheet on Furnace, Air Conditioner ,and Heat Pump Efficiency Standards Agreement,” ACEEE, last accessed May 24, 2011, http://www.aceee.org/files/pdf/1009hvac_fact.pdf

4-1 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-1-1 Develop recommended standards and present to DOE	IOU Codes & Standards Staff	Assemble key stakeholders and parties to develop recommended standards	Complete
		Draft standards	Complete
		Develop consensus for standards	Complete
		Submit standards to DOE for consideration	Complete

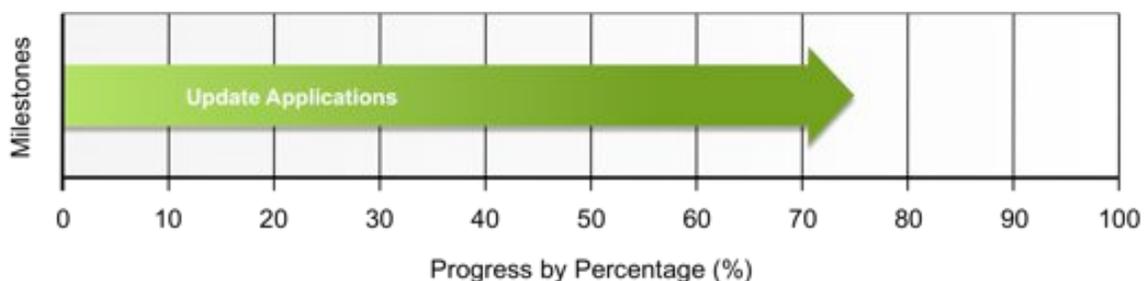
PRIORITIES FOR THE FUTURE (2013-2020)

- **Advocate higher commercial standards.** Climate optimized standards for commercial cooling equipment are essential for meeting zero net energy goals in the commercial sector and should be actively pursued through collaborative regional and national efforts.
- **Establishing pathways for more efficient HVAC equipment.** Advanced evaporative cooling technology (including hybrid units) and variable refrigerant flow cooling products largely exceed the energy efficiency performance of standard equipment. The manufacturers of these more efficient cooling products should be strongly supported in reach and green codes, utility programs and government purchasing programs.

STRATEGY 4-2: UPDATE “TOTAL AVOIDED COST MODEL” AND TITLE 24 “TIME DEPENDENT VALUATION” CALCULATIONS, INCLUDING USE OF PEAK ENERGY VALUES

In California, there is one method of calculating a long-run forecast of the hourly avoided costs of energy for the purpose of assessing the cost-effectiveness of energy efficiency programs and portfolios. The CPUC adopted Avoided Cost Methodology is a tool that estimates utility supply side avoided cost as a result of demand-side energy savings. At CEC, the T24 Time-Dependent Valuation (TDV) methodology is used to assess new energy efficiency per building code requirements largely by approximating a building’s relative savings based on the weighing of the different values of the various installed efficiency measures when energy savings occur relative to code requirements. TDV does not provide an energy savings value nor an avoided cost.

PROGRESS TO DATE (2010-2012)



Currently at 75 percent progress, the current T24 adoption cycle (delayed until 2013) includes headway on this strategy, leading to more accurate and consistent valuation of HVAC efficiency contribution to peak savings.

- **TDV 2013 Revision.** New TDV values related to climate zone weather data have been developed by the CEC for compliance calculations for the 2013 T24 code revision that is currently underway. In the updated 2013 TDV methodology, each climate zone’s peak weather data have been made coincident with the statewide peak regardless of when the local peak occurs. Using the CEC’s revised TDV weather files, residential peak demand reduction from efficiency measures including HVAC, could be up to 50 percent higher in TDV and nonresidential peak reduction could be up to 10 percent higher in TDV.⁵⁰

4-2 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-2-1 Evaluate, revise and update as needed in state and federal applications	CEC Codes & Standards Staff	Evaluate existing computer applications for modeling (e.g., eQUEST, EnergyPlus, EnergyPro)	Complete
		Identify necessary revisions for relevant computer modeling applications	Complete
		Provide recommendations to relevant organizations	Complete
		Update all software perT24 implementation	Q4 2012

PRIORITIES FOR THE FUTURE (2013-2020)

- **Update Avoided Cost Methodology.** The CPUC should consider updating its Avoided Cost Methodology for energy efficiency to include the updated 2013 TDV weather files. This update will provide updated values in addition to the updated CEC weather files including the latest market prices and related information with which to appropriately value energy efficiency as an avoided supply cost.

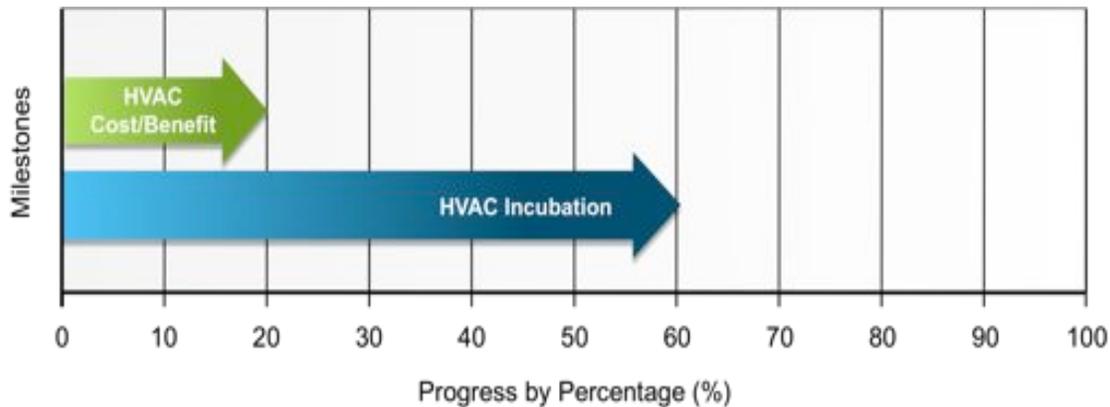
STRATEGY 4-3: ACCELERATE MARKET PENETRATION OF ADVANCED TECHNOLOGIES BY HVAC INDUSTRY PROMOTIONS AND UPDATING/EXPANDING CURRENT UTILITY PROGRAMS TO INCLUDE THE NEW TECHNOLOGIES AS APPROPRIATE

While there are a variety of tools to motivate market transformation (e.g., graduated incentives), the Strategic Plan considers emerging technologies—innovative technologies, applications and analytical tools and services not yet widely adopted—as fundamental to achieving California’s energy efficiency vision. The Strategic Plan’s ambitious goals for HVAC require greater partnership with efficiency

⁵⁰ “TDV Standard 2013 Base Standards, Presentation to the CEC (November 2010), http://www.energy.ca.gov/title24/2013standards/prerulemaking/documents/2010-11-16_workshop/presentations/04-05_E3-Economics.pdf

entrepreneurs and original equipment manufacturers (OEMs) to overcome market barriers and ensure that advanced cooling technologies (including accounting for real-time costs during peak periods via advanced metering systems) survive the “Valley of Death” (a period after new products are introduced, but languish due to market entry challenges) and end-up in California’s homes and businesses. In addition, OEM manufacturer product development and launch cycles must be recognized in the Action Plan process. In addition to the ability to update ratepayer-funded programs mid-cycle (via advice letters), 2010 launched efforts (detailed below) to encourage introduction of promising technologies for this high priority strategy.

PROGRESS TO DATE (2010-2012)



As illustrated in the progress indicator, comprehensive assessment of advanced HVAC technologies is on its way (20 percent) as are efforts to incubator advanced HVAC technologies (60 percent).

- **SMUD’s Customer Advanced Technology (CAT) Program.**⁵¹ The CAT program evaluates a variety of energy efficiency and renewable energy opportunities and products for its customers. CAT encourages customers to use and evaluate new or underutilized technologies. Customer participation requires two-year monitoring access by the program to ensure that performance is verifiable and sustainable.
- **Tech Resource Incubator Outreach Program (TRIO).** The Technology Research Incubator Outreach Program (TRIO) is designed to nurture new innovative technologies from universities and investor firms through symposiums, training and support services. TRIO is linked to all of the utility emerging technology programs and is also linked with the Clean Tech Open, a California-based initiative with state-level, national and global linkages to clean technology including energy efficiency.
- **US DOE HVAC Roadmap.** The DOE is developing a national HVAC Roadmap that will add emphasis nationally to intelligent controls and sensor technology, residential envelope and equipment integration, commercial whole building integration, and packaged heating, cooling, and heat pump equipment and related component technology

⁵¹ Sacramento Municipal Utility District Customer Advanced Technology Program, SMUD, last accessed May 24, 2011, <http://www.smud.org/en/education-safety/cat/Pages/index.aspx>

4-3 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-3-1 Conduct a comprehensive cost-benefit analysis of leading and prospective advanced technologies and use to prioritize utility incentive offerings and HVAC industry deployment strategies	WHPA Advanced Technology Committee	Identify prospective and advanced HVAC technologies	Ongoing
		Conduct comprehensive cost-benefit analysis of technologies	Ongoing
	IOU HTDSA Program Staff	Prioritize and assess incentive options	Q1 2012
		Assess HVAC industry deployment strategies; find high-leverage alignment between incentives and industry strategies	Q2 2012
		Propose modifications to existing incentives or offer recommendations for next program cycle 2014-2016	Q4 2012
4-3-2 Establish an incubator program to accelerate commercialization of most promising technologies	IOU TRIO Coordinator	Develop concept and program plan (TRIO)	Complete
		Identify entrepreneurs and venture capitalists as TRIO targets	Complete
		Develop and hold forums in geographically diverse locations	Ongoing
		Convene geographically diverse “open house” at IOUs for entrepreneurs to pitch ideas	Ongoing
		Assess TRIO impacts	Q4 2012

PRIORITIES FOR THE FUTURE (2013-2020)

- Expand relationships with emerging technology entrepreneurs.** The cluster of energy efficiency related programs and initiatives in California—including the UC Davis Energy Efficiency Center, the Western Cooling Efficiency Center, the California Lighting Technology Center the Plug-In Electric Vehicle Research Center, the Program for International Energy Technologies, the Center for Entrepreneurship and the California Clean Energy Fund (CalCEF) —can support entrepreneurs with new ideas and products with technical, engineering, testing, financing, and investment support services. These private/public partnerships should be maximized to further energy efficiency sector goals throughout the state.

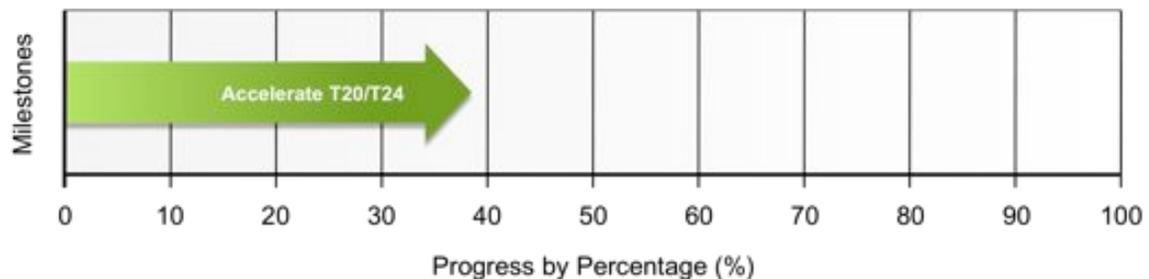
STRATEGY 4-4: ADOPT A PROGRESSIVE SET OF BUILDING CODES THAT SUPPORT THE DEPLOYMENT OF PEAK EFFICIENT EQUIPMENT

Residential and commercial air conditioners are the principal cause of peak electrical energy (energy used during time of high system demand primarily between 4:00 p.m. and 7:00 p.m. on hot summer days) use in California. Nearly 100 percent of the difference between regular base load electricity use and the peak load is from air conditioning.⁵² Extremes in high and low temperatures create peak demand, thus

⁵² Ibid, 7. Appendix A.

making HVAC performance a crucial link in managing peak loads. While peak demand reduction mechanisms including utility programs and rate design (TDV-responsive rates will be in place for all California ratepayers in 2014) provide a strong signal to customers for managing their use of electricity during the peak demand hours, providing mandatory code requirements assures deeper peak reduction impact. It is important to approach code change in a step-by-step way, first telegraphing direction in reach codes that go beyond current standards and allow industry time to adapt. Since early 2010, efforts have been pursued to realize these strategies by supporting higher mandatory federal efficiency standards as the lowest cost option for consumers and ratepayers.

PROGRESS TO DATE (2010-2012)



The development of code that encourages peak demand hours is approximately 38 percent complete. Due to delays in the T24 update process, progress here is perhaps less advanced than it would have been, if original timelines had been adhered to.

- **Path to ZNE With Title 24.** The ZNE Action Plan contains Strategies and Key Actions that are aimed at integrating zero net energy support in T24. Collaboration between the two action plans is expected once the HVAC Action Plan is launched.
- **National Stakeholder Agreement.** The agreement signed by the CEC, allows a higher SEER and EER in residential air conditioning equipment for adoption in T24. This will provide cost-effective peak load management benefits.

4-4 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-4-1 Enhance and accelerate the deployment of Title 20/24 codes	IOU Codes & Standards Enhancement Initiative Eurlyne Geiszler, CEC Codes & Standards Staff	Identify priority HVAC code change topics for T24 2013 revision	Complete
		Conduct stakeholder workshops on code change topics as necessary	Ongoing
		Propose initial changes for 2013 T24	Q3 2011
		State reach code and T24 improvements in effect	Q4 2014 ⁵³

⁵³ Due to delays in code updates, this timeline falls outside of the near-term implementation cycle (2010-2012).

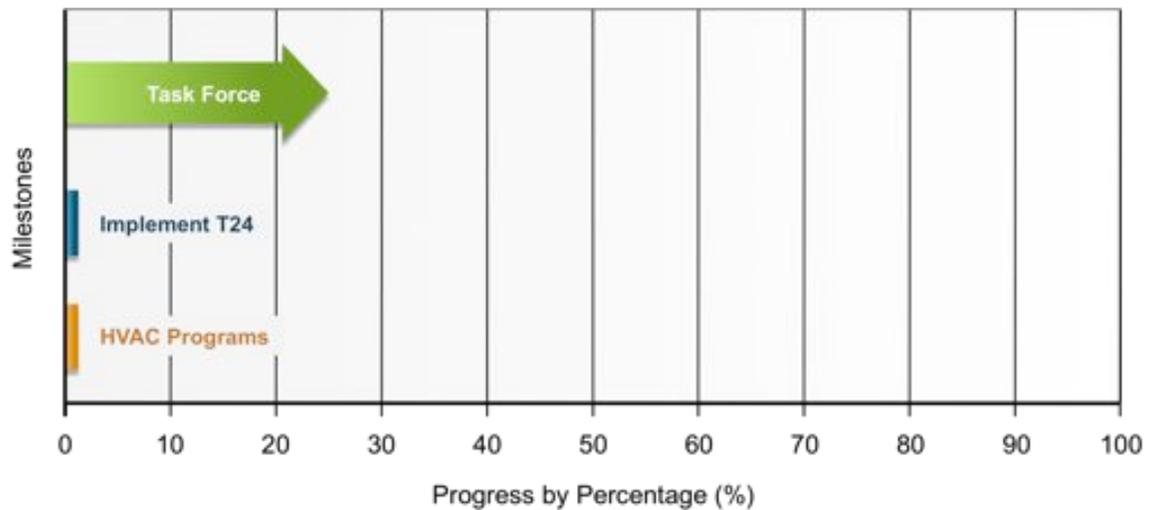
PRIORITIES FOR THE FUTURE (2013-2020)

- **Exemption from federal pre-emption.** The federal government sets national energy efficiency standards for HVAC equipment, but uniform standards do not consider impacts of cooling energy performance due to climate conditions (like hotter, drier climate found in the West). There is an administrative mechanism to apply for exemptions from the DOE that should be explored in collaboration with western states that have similar interests in maximizing energy efficiency to limit climate change.
- **Advanced technology in code.** New advanced evaporative HVAC equipment and thermal energy storage systems can provide substantial peak load reduction benefits. Approaches to codifying these benefits in T24 should be formally assessed collaboratively through CEC and the IOU Codes and Standards Enhancement program.

STRATEGY 4-5: DEVELOP NATIONWIDE STANDARDS AND/OR GUIDELINES FOR ONBOARD DIAGNOSTIC FUNCTIONALITY AND SPECIFICATION FOR DESIGNATED SENSOR MOUNT LOCATIONS

Expanding and ensuring quality maintenance is a central element of the Plan's HVAC strategies. All residential and commercial HVAC systems naturally degrade in performance over time, especially for commercial units that are on rooftops and exposed to the weather. Occupant complaints are the main method that building owners know that are problems in the building's HVAC operation. However, most operating problems that degrade energy performance are not noticed by the owners or occupants and can result in wasted energy for years. There are no national industry standards or requirements that address providing notice of performance problems in residential and commercial HVAC equipment or the appropriate location of sensors for the accurate control of the systems. To achieve the goals of the Strategic Plan, HVAC system fault detection and diagnostics (FDD) with remote communication capability must proliferate in the market as soon as possible. By prioritizing this strategy, California can work towards proactive maintenance that can prevent emergency replacements that may be of lower efficiency than might otherwise be chosen.

PROGRESS TO DATE (2010-2012)



Many activities are underway to advance embedded fault detection (e.g. FDD in T24, discussions with ASHRE’s Technical Committee on Smart Buildings, WHPA FDD subcommittee). In fact, there is much more progress than the indicator alone suggest. While a task force was been working on activities related to FDD (25 percent), implementing code changes and transforming IOU programs is bound by regulatory calendars. Significant leaps forward will occur with the next program cycle. Progress includes:

- **HVAC Technology System Diagnostic Advocacy Program (HTSDA).** Through the HTSDA, the California IOUs are working to provide a comprehensive approach to the numerous challenges involved in transforming the HVAC equipment market including FDD and sensor-related issues including placement and quality.
- **CEC PIER Title 24 Rooftop Unit (RTU) FDD Project.** PIER has supported FDD research and commercialization efforts for several years in addition to efforts aimed at T24. In 2009, PIER started development on 2013 T24 standards revision process for FDD as a prescriptive measure for new RTUs, including a remote communications capability. This change will increase the chance that remedial actions will avoid a costly breakdown or a compromise of indoor air quality.
- **Codes and Standards Enhancement (CASE) Program.** The California IOUs initiated the CASE program as a channel for proposing new efficiency measures for T24 consideration. The CASE program for the 2013 T24 revision includes a proposal for RTU FDD prescriptive measure including a remote communications capability (a joint proposal from CASE and PIER teams).
- **Virtual RTU Diagnostics.** Researchers at the University of Nebraska funded by the CEC PIER Program, are currently developing a set of ‘virtual sensors’ to based on adjusting onboard sensor data. No additional hardware will be needed to implement the FDD functions, potentially providing a lower cost solution to providing embedded comprehensive system monitoring
- **US DOE/Commercial Building Energy Alliances (CBEA) High Performance Rooftop Unit Challenge.**⁵⁴ The Challenge has been issued to the HVAC industry for a higher efficiency 10-ton rooftop unit with a comprehensive specification for FDD and remote communications. Challenge entrants receive technical assistance and the opportunity to sell new units to some of the largest

⁵⁴ High Performance Rooftop Unit Challenge, US. DOE, last accessed May 25, 2011, http://www1.eere.energy.gov/buildings/alliances/rooftop_specification.html.

retail chains and property management firms in the U.S. This initiative is the first national framework for onboard diagnostics including sensor placement for commercial HVAC systems.

4-5 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-5-1 Establish an industry-wide task force to develop national standard diagnostic protocols	WHPA FDD Subcommittee	Create In-Field/Onboard FDD Subcommittee under the Advanced Technology Committee within WHPA	Complete
	WCEC Staff	Develop national technology standards including a standard evaluator or method of test; Collaborate with ASHRAE, ENERGY STAR, CEE, AHRI	Q3 2011
	IOU HTSDA Program Staff	Create a specification for designated sensor mount locations	Q4 2011
		Propose FDD additions to ASHRAE Standard 90.1, 189.1	Q1 2012
4-5-2 Begin implementation	WCEC Staff	Final RTU FDD 2013 T24 submission	Q3 2011
		Inventory relevant reach codes; provide HVAC update	Q4 2011
		Promulgate reach code	Q1 2012
		Title 24 and reach code start dates	Q1 2014
4-5-3 Incorporate into HVAC industry and utility programs	IOU HTSDA Program Staff	Identify most effective ways to integrate standards with HVAC industry	Q4 2011
		Develop recommendations to incorporate standards into next IOU program cycle 2014-2016	Q1 2012

PRIORITIES FOR THE FUTURE (2013-2020)

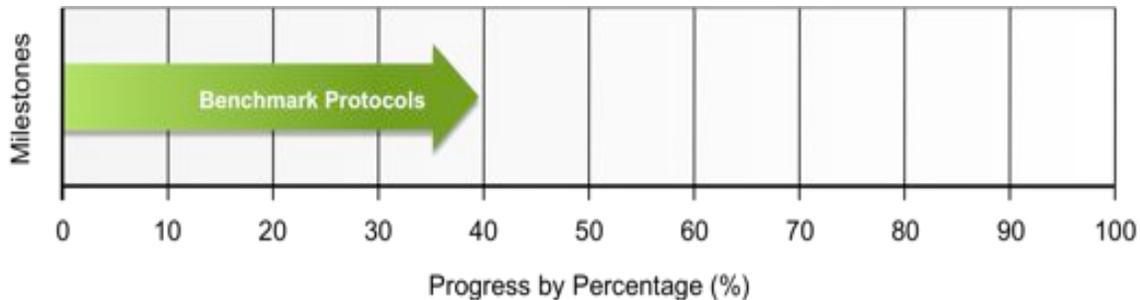
- **Expand diagnostic systems for all HVAC.** Currently, the most fully featured onboard diagnostic systems are found in only the more expensive, high-end HVAC systems with the lowest market share. This is related to the HVAC industry’s business model of providing a range of products, features and prices commonly described as “good-better-best.” To achieve the Plan’s goals, manufacturers would have to upgrade all rooftop unit product lines to microprocessor control.
- **Ensure product availability.** In addition to the FDD capabilities available from the HVAC manufacturers in some product lines, there are third party suppliers of automated FDD products as well as portable diagnostic tools for field service work. However, to reach the goals of the Strategic Plan, these diagnostic tools must be more widely available and effectively used by contractors.

STRATEGY 4-6: PRIORITIZE IN-FIELD DIAGNOSTIC AND MAINTENANCE APPROACHES BASED ON THE ANTICIPATED SIZE OF SAVINGS, COST OF REPAIRS AND THE FREQUENCY OF FAULTS OCCURRING

As with so many elements of the Strategic Plan, research is required to better understand how to prioritize specific technologies, incentives, behavior changes and maintenance approaches. With the

majority of energy savings failures occurring as a result of installation and maintenance issues, it is no small question to ask, “Why are there so many problems in the field?” California needs to better understand what are the high-leverage diagnostic and maintenance approaches that will yield the most savings. Efforts to address field issues must coordinate with both Goal 1 in this action plan (code compliance) as well as efforts in workforce, education and training (WE&T). A high priority strategy, progress on in-field diagnostics has been underway since 2010.

PROGRESS TO DATE (2010-2012)



A priority, transforming fault detections efforts based on studies is nearly half complete (40 percent). These initial results are a bit deceiving, as California can expect to see the results of study assessment and more application of findings in latter 2011 and 2012.

- **In-Field Diagnostics and Maintenance Study.** SCE conducted field research related to the use of the ACCA Standard 180 for maintaining energy performance in commercial rooftop units (RTUs). The work resulted in the development of a program being implemented statewide by the IOUs in 2011. A residential diagnostics and maintenance program is in development for statewide implementation.
- **HVAC Maintenance Study.** Published in 2010, this study by Davis Energy Group⁵⁵ assesses the uncertainties currently in field methods for diagnosing and maintaining the equipment, including verification approaches, technology and human factors. The report concludes that utility-sponsored maintenance programs need to be refined, improved and redesigned, and provides recommendations to develop more effective and consistent diagnostic protocols.
- **Purdue Diagnostic Protocol Evaluator Project.**⁵⁶ Led by Jim Braun at Purdue University, this PIER-supported project should lead to a national protocol to test refrigeration and airflow diagnostic tools used to check air conditioners for performance. No such standard exists today, and will test the accuracy and consistency of in-field diagnostic tools. Results are expected in Q2 2012.

⁵⁵ HVAC Energy Efficiency Maintenance Study, Davis Energy Group and the Western Cooling Efficiency Center, December 2010, http://www.calmac.org/publications/HVAC_EE_Maintenance_Final.pdf

⁵⁶ CEC PIER Diagnostic Protocol Evaluator Project, PIER, July 30, 2010, <http://www.performancealliance.org/LinkClick.aspx?fileticket=QRllW0TO4Q8%3d&tabid=203&mid=736>

4-6 ACTION PLAN (2010-2012)

Milestone	Champions	Key Actions	Timeline
4-6-1 Benchmark existing diagnostic, repairs and maintenance protocols and develop appropriate products	WHPA Subcommittee on FDD	“Benchmark” and assess existing protocols (including savings and cost-benefit/effectiveness)	Complete
		Create gap analysis of existing protocols and future needs	Complete
		Recommend priority activities to impact human behavior elements and product development	Q4 2011
		Institute voluntary industry agreement to deliver priority changes	Q1 2012
		Work with OEMs to develop appropriate products and ensure product availability	Q2 2012

PRIORITIES FOR THE FUTURE (2013-2020)

- Collect and disseminate more field data and experience.** As with many sectors in the Strategic Plan, the HVAC industry is in need of more information to assess appropriate next steps in product design and deployment. Additional dollars must be dedicated to data collection and analysis of the highest value diagnostics, repairs and maintenance—as well as a repository of this information readily accessible to the HVAC industry and interested consumers. The CPUC’s www.Engage360.com and the WHPA’s www.performancealliance.org websites are accessible places for posting this information.
- Work with HVAC manufacturers to enhance rooftop unit maintainability.** A number of recommendations to make it easier and less costly for HVAC service technicians to provide regular maintenance have been made through the CEC PIER Advanced Rooftop Unit project. WHPA Committees including QI/QM and FDD along with the IOU HTSDA program will work with manufacturers on the options identified.

APPENDIX A

KEY TERMS AND ACRONYMS

- **EER.** Energy Efficiency Ratio. The EER of a particular air conditioning system is the ratio of output cooling (in Btu/hr) to input electrical power (in Watts) at a given operating point (indoor/outdoor temperature and humidity conditions). Commercial systems are most often labeled with just an EER number rather than a SEER number.
- **FDD.** Fault detection and Diagnostics. FDD is a tool that is necessary in order to track potential operating problems in any residential or commercial HVAC system. When coupled with a remote communication gateway, a message can be sent to notify the building owner or service contractor that there is a problem with the unit.
- **HERS.** Home Energy Rating System. HERS is an energy efficiency scoring system established by the Residential Energy Services Network (RESNET). HERS raters deliver whole-house home energy ratings that provide California homeowners and homebuyers with information about the energy efficiency of the homes they live in or homes they are considering for purchase. Home Energy Ratings are required in California building codes, and recognized by the ENERGY STAR home program and mortgage lenders.
- **HTSDA.** HVAC Technology and System Diagnostic Advocacy Program. This program represents the IOU programmatic follow through to the 2010-2012 Statewide HVAC Program Implementation Plans filed with the CPUC.
- **Quality Installation (QI).** QI refers to the field practices described by the ACCA 5 QI – 2010 HVAC Quality Installation Specification Standard for residential and commercial HVAC systems. The specification identifies requirements associated with quality installations, acceptable procedures for measuring or verifying the attainment of those requirements, and acceptable forms of documentation to show compliance to the requirements.
- **Quality Maintenance (QM).** QM refers to field practices described in two ACCA national standards, one for residential HVAC systems (Standard 4) and one for commercial HVAC systems (Standard 180). Each specification identifies requirements associated with quality maintenance procedures, verifying attainment of the requirements and acceptable forms of documentation to show compliance with the requirements.
- **RESNET.** Residential Energy Services Network. RESNET is a non-profit organization founded by the National Association of State Energy Officials and Energy Rated Homes of America to develop a national market for home energy rating systems and energy efficient mortgages.
- **SEER.** Seasonal Energy Efficiency Ratio. The SEER rating of a unit is the cooling output in Btu (British thermal unit) during a typical cooling-season divided by the total electric energy input in watt-hours during the same period. Residential central air conditioners are rated by SEER for marketing purposes.
- **TDV.** Time Dependent Value. The CEC has adopted TDV for valuing energy and demand savings. TDV accounts for variations in cost of electricity production related to time of day, seasons, geography and fuel type. The use of TDV criteria to account for the energy savings during the high cost times of the day and year, and which are more closely tied to the actual variations in energy costs, would encourage the design and construction of buildings which reduce the peak demands on the energy system in California.

APPENDIX B

ADDITIONAL STATE AND NATIONAL PARTNERS

As part of this action plan, HVAC champions will track strategies for adoption in California and develop partnerships that help coordinate efforts and advance Plan goals. Examples include:

- **American Council for an Energy Efficiency Economy (ACEEE).** ACEEE is a non-profit public organization that conducts in-depth technical and policy analysis, working to establish new directions in effective energy efficiency policy and programs. <http://www.aceee.org>
- **Air-Conditioning Heating, and Refrigeration Institute (AHRI).** AHRI's 300 member companies produce more than 90 percent of the residential and commercial air conditioning, heating, water heating, and commercial refrigeration equipment made in North America. AHRI develops standards and certification programs. <http://www.ahrinet.org/>
- **American Society of Heating Refrigeration and Air Conditioning Engineers (ASHRAE).** ASHRAE advances heating, ventilation, air conditioning and refrigeration to promote a sustainable world. ASHRAE sets model energy standards and a number of related standards adopted by states and local jurisdictions in the US. <http://www.ashrae.org/>
- **Lawrence Berkeley National Laboratory (LBNL).** Part of the national laboratory system, LBNL at the University of California/Berkeley, provides a wealth of information on a range of advanced technologies (including HVAC), energy policy/analysis, buildings energy efficiency and indoor/outdoor environmental quality through the Environmental Energy Technologies Division. <http://eetd.lbl.gov>
- **Air Conditioning Contractors of America (ACCA).** ACCA is a non-profit association serving more than 60,000 professionals and 4,000 businesses in the HVACR industry, working to promote professional contracting, energy efficiency, and healthy indoor environments. ACCA publishes standards and guidelines related to residential and commercial HVAC. <http://www.ashrae.org/>
- **ENERGY STAR Buildings & Plants Program.** This national ENERGY STAR program provides methods for rating new building designs through its Target Finder program and for existing buildings through the Portfolio Manager program. http://www.energystar.gov/index.cfm?c=business.bus_index
- **IHACI.** Institute of Heating & Air Conditioning Industries. IHACI is a non-profit trade association of contractors, manufacturers, distributors, utility firms, and related businesses actively engaged in the heating, ventilation, air conditioning, refrigeration, and sheet metal industries. www.ihaci.org/
- **North American Technician Excellence (NATE).** NATE the leading non-profit certification program for technicians in the heating, ventilation, air conditioning, and refrigeration (HVAC/R) industry and offers the only credentialing test supported by the entire industry. <http://www.natex.org/>
- **Sheet Metal and Air Conditioning Contractors' National Association.** SMACNA is a national organization that provides training programs in all aspects of HVAC technology for its members. <http://www.smacna.org/>
- **U.S. Department of Energy (DOE).** DOE has set a goal to achieve marketable zero net energy commercial buildings in all climates by 2025. DOE supports many end-use technologies in addition to HVAC through national standards setting procedures, research and development, Roadmaps, and commercialization support. DOE is developing a national HVAC Roadmap. www.energy.gov/
- **Western Cooling Efficiency Center (WCEC).** WCEC is part of the Energy Efficiency Center at the University of California/Davis. WCEC was established to develop high efficiency cooling options for the hot dry climate in the western states, with an initial focus on California requirements. WCEC sponsors the Western Cooling Challenge. <http://wcec.ucdavis.edu/>

APPENDIX C

RELATED DOCUMENTS

California Long Term Energy Efficiency Strategic Plan. (California Public Utilities Commission, 2008)
<http://www.californiaenergyefficiency.com/docs/EEStrategicPlan.pdf>

The CPUC's roadmap for energy efficiency in California through the year 2020 and beyond.

California Energy Commission, Strategic Plan to Reduce the Energy Impact of Air Conditioners. (Jun 2008), <http://www.energy.ca.gov/2008publications/CEC-400-2008-010/CEC-400-2008-010.PDF>
The CEC developed it's HVAC Strategic Plan in a separate proceeding and has some different ideas for moving HVAC efficiency forward.

The HVAC Convener's Report. (Jan 2008, CEC)
<http://www.performancealliance.org/LinkClick.aspx?fileticket=n5AaFTvGHIU%3d&tabid=212&mid=700>
The Convener's Report is the basis for much of the work that went forward in both the CPUC and CEC's Strategic Plans for HVAC.

HVAC Energy Efficiency Maintenance Study. (Dec 2010. Davis Energy Group).
<http://www.performancealliance.org/LinkClick.aspx?fileticket=MbiriQDqsfA%3d&tabid=212&mid=700>
The study assesses the uncertainties currently in field methods for diagnosing and maintaining HVAC equipment, improvement in EM&V approaches, improved technology, and human factors. The report noted the complexity of achieving the stated objectives and made recommendations to perform studies and pilots to identify the appropriate solutions that could be integrated in utility programs. The report authors conclude that utility-sponsored maintenance programs need to be refined, improved and redesigned, and provide recommendations for future activities. The authors also called for further research, lab and fields tests, and pilot efforts by supported by the utilities, CEC PIER, US DOE, and the CPUC to develop and test more effective and consistent diagnostic protocols.

Energy Efficiency in Buildings: Transforming the Market: Roadmap. (World Business Council for Sustainable Development, 2009):
http://www.wbcds.org/DocRoot/E1erYPqD60xOaOIAdV5V/91719_EEBReport_WEB.pdf
Recommendations and an actionable roadmap to transform the building sector based on modeled impacts of consumer preferences and behaviors, designs and technologies, and policies on energy consumption.

Zero Net Energy Action Plan. (Sep 2010), <http://www.cpuc.ca.gov/NR/rdonlyres/6C2310FE-AFE0-48E4-AF03-530A99D28FCE/0/ZNEActionPlanFINAL83110.pdf>

The ZNE Action Plan is the first action plan that followed from the CPUC Strategic Plan. It lays out a path to the net zero goal for the California commercial buildings sector by 2030.

APPENDIX D

HVAC ACTION PLAN OUTREACH LIST & WORKSHOP ATTENDEES

Jerine Ahmed, SCE
John Anderson, Rheem Manufacturing
Marlin Avis, Synergy Corporation
Bruce Baccei, Energy Efficiency Emerging Technologies
Michael Bailey, ECOS Consulting
Simon Baker, CPUC
Jim Bazemore, EMI Consulting
Ken Belding, Empire Comfort Systems
Paola Benassi, PG&E
Athena Besa, Semptra Utilities
Allison Bially, PEI
Anne Blankenship, Resource Solutions Group
Gloria Bowen, SDG&E
Brian Buskirk, PEI
Mark Cherniack, New Buildings Institute
Carl Cimino, Pipe Trades Training Center
Dave Clark, Synergy Companies
Scott Clay, Enalasy
Chris Compton, HVACR Education
Abram Conant, Proctor Engineering
Ruzwa Cooper, Cooper Oates Air Conditioning
Jim Crawford, Trane
Ruth Davis, Williams Comfort
Karen des, PEI
Elizabeth DeSouza, Conservation Services Group
Piotr Domanski, National Inst of Standards & Technology
Tom Downey, Proctor Engineering
Erik Emblem, 3EInternational
Marybelle Ang, TURN
Lisa Gartland, Opinion Dynamics
Eurlyne Geiszler, CEC
Barbara George, Women's Energy Matter
Jennifer Green, California Center for Sustainable Energy
Phillip Grosenbach, General Heating and Air Conditioning
Dale Gustavson, Better Buildings Inc.
Jessie Halpern-Finnerty, UC Berkeley Labor Center
Jim Hanna, Energy Solutions
Rick Hatlen, J.J.A.T.C.
Campbell , Hawkins, SCE
Kristin Heinemeier, WCEC
Robert Helminiak, AHRI
Jeff Henning, MSDC
Craig Henriksen, Staples Energy
Luke Hermann, Enalasy
Serafima Higginson, Honeywell
Jeff Hirsch, James J. Hirsch & Associates
Brenda Hopewell, PEI
Julie Humes, Lennox Industries
Peter Jacobs, BuildingMetrics
David Jacot, SCE
Daniel Jones, Honeywell
Derek Jones, PG&E
Ean Jones, Verified, Inc.
Russ King, ACCA
Brian Kohler, Field Diagnostics
Don Langston, Aire Rite
Lance de Laura, SCG
Sandy Lawrie, PG&E
Edward Leverett, Conservation Services Group
Jeff Livingston, Conservation Services Group
Brian Maloney, Resource Solutions Group
Denny Mann, Marina Mechanical
Mike Martin, Staples Energy
Daniel McDonald, PG&E
Jarred Metoyer, KEMA
Tom Meyer, Praxis Green Inc.
Tyler Miner, Redlands Plumbing Heating & AC
Cynthia Mitchell, TURN
Jill Mojica, Air Conditioning Trade Association
Tom Morton, Piping Industry Progress & Education Fund
Robert Mowris, Verified, Inc.
David Nemtzow, ICE Energy
Terry Pang, Energy Solutions
Ravi Patel, SMUD
Joshua Pierce, RHA Inc.
Seth Portner, Masco Home Services
David Price, Synergy Companies
Jennifer Quade, ICE Energy
Jeremy Reefer, SDG&E
Justin Regnier, CEC
Josh Rosa, Nossaman LLP representing Cal SMACNA
Dale Rossi, Field Diagnostics
Carlos Ruiz, SCG
Ryan Schmidt, Heschong Mahone Group, Inc.
Chris Scruton, CEC
David Shallenberger, Synergy Companies
Kristina Skierka, CPUC
KC Spivey, PG&E
Frank Stevens, Air Conditioning Trade Association
John Stoops, KEMA
Kurt Streule, Pacific Rim Mechanical
Don Tanaka, Southern California Pipeline Construction
Buck Taylor, Roltay Inc. Energy Services
Albertina Thai, PG&E
Glenda Towns, SCG
James Tuleya, PG&E
Chris Ungson, CPUC
Ed Vine, CIEE
Chris Walker, Nossaman LLP representing Cal SMACNA
Mike Weil, Penton Media
Howard Weiss, HVAC Excellence
Bob Wiseman, Canoga Park Heating & Air Conditioning
Gary White, Masco Home Services
Don Wiggins, SDG&E
Ruben Willmarth, Mitsubishi Electric HVAC
Rick Wylie, Beutler Corporation
Randy Young, Sheet Metal Workers Local 162
Carol Zabin, UC Berkeley Labor Center

APPENDIX E

WHPA COMMITTEES AND CHAMPIONS⁵⁸

WHPA Steering Committee

Rocky Bacchus, Efficiency Power
 Simon Baker, California Public Utilities Commission (CPUC)
 Kathy Corr, North American Technician Excellence (NATE)
 Ruth Ann Davis, Williams Comfort
 Russ Donnici, Mechanical Air Service
 Erik Emblem, Sheet Metal Workers' International Association
 Western States Council (SMWIA)
 Tom Garcia, California Building Officials (CALBO)
 Eurlyne Geiszler, California Energy Commission (CEC)
 Dominick Guarino, National Comfort Institute (NCI)
 Glenn Hourahan, Air Conditioning Contractors of America
 Julie Humes, Lennox Industries
 Jim Hussey, Sheet Metal Workers' International Association
 Local 104 (SMWIA)
 Mel Johnson, Southern California Edison At Large (SCE)
 Paul Kylo, Southern California Edison Statewide Lead
 Don Langston, Aire Rite Air Conditioning & Refrigeration
 Gregg Lawless, San Diego Gas & Electric Statewide Lead
 Mark Lowry, Refrigeration Service Engineers Society
 Warren Lupson, Air Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 Jon Melchi, Heating, Air conditioning & Refrigeration
 Distributors International (HARDI)
 Carlos Ruiz, Southern California Gas (SoCalGas)
 Craig Sherman, Sacramento Municipal Utility District
 KC Spivey, Pacific Gas & Electric At Large (PG&E)
 Bill Spohn, TruTech Tools
 James Tuleya, Pacific Gas & Electric Statewide Lead
 Bob Wiseman, Institute of Heating & Air Conditioning
 Industries, Inc. and Indoor Comfort News Board (IHACI)
 Rick Wylie, Beutler Corporation

Goal 1 - Compliance Committee (includes Permitting, 2013 Standards, Compliance, Enforcement subcommittees)

Lynn Benningfield, Benningfield Group
 Gloria Bowen, SDG&E
 Lance DeLaura, SDG&E/SoCal Gas
 Eurlyne Geiszler, California Energy Commission (CEC)
 Ron Gorman, SDG&E/SoCal Gas
 Luke Herman, Enalasis
 Jon Melchi, Heating, Air Conditioning & Refrigeration
 Distributors International (HARDI)
 Jill Marver, Pacific Gas & Electric (PG&E)
 Ravi Patel, Sacramento Municipal Utility District
 Robert Scott, California Home Energy Efficiency Rating
 Services (CHEERS)
 Craig Sherman, Sacramento Municipal Utility District
 Rick Wylie, Beutler Corporation

Goal 2- HVAC QI/QM Committees (Includes Commercial QM, Commercial QI, Residential QM, WE&T subcommittees)

Hugo Aguilar, International Association of Plumbing and
 Mechanical Officials (IAPMO)
 Rus Andrews, Indoor Environmental Services (IES)

Gary Awai, Bell Products
 Raad Beashar, Southern California Gas (SoCalGas)
 Gloria Bowen, San Diego Gas & Electric (SDG&E)
 Scott Clay, Enalysis
 Carl Cimino, UA Pipe Trades Training Center N. California
 Chris Compton, HVACRedu.net
 Kathy Corr, North American Technician Excellence, Inc.
 Liz DeSouza, Conservation Services Group (CSG)
 Steven DeStefano, Pacific Rim Mechanical
 Tom Downey, Proctor Engineering
 Viviane Essex, Portland Energy Conservation, Inc. (PECI)
 Susie Evans, Institute of Heating & Air Conditioning
 Industries, Inc. and Indoor Comfort News (IHACI)
 Mike Gallagher, Western Allied
 Greg Gillis, Pacific Gas & Electric (PG&E)
 Greg Gordon, Airco Commercial
 Dominick Guarino, National Comfort Institute (NCI)
 Dale Gustavson, Better Buildings, Inc.
 Rick Hatlen, Joint Journeyman Apprentice Training Center
 Patrick Heeb, Long Beach City College
 Bob Helbing, Air-Tro, Inc.
 Luke Herman, Enalasis
 Glenn Hourahan, Air Conditioning Contractors of America
 Sherry Hu, Pacific Gas & Electric (PG&E)
 Jim Hussey, Sheet Metal Workers Local 104 Training Fund
 Mel Johnson, Southern California Edison (SCE)
 Daniel Jones, Honeywell
 Ean Jones, Verified, Inc.
 Brian Kohler, Field Diagnostics Services, Inc. (FDSI)
 Paul Kylo, Southern California Edison (SCE)
 Ken Lavigne, San Diego Sheet Metal J.A.C. Training
 Patty Leiser, HVACRedu.net
 Ed Leverett, Conservation Services Group (CSG)
 Matt Lobrovich, Beutler Corporation
 Mark Lowry, Refrigeration Service Engineers Society
 Warren Lupson, Air-Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 Denny Mann, Marina Mechanical
 Dave Manoguerra, Enalasis
 Tom Morton, Piping Industry Progress & Education (PIPE)
 Trust Fund
 Robert Mowris, Verified, Inc.
 Adam Muliawan, International Association of Plumbing and

⁵⁸ The following individuals and organizations have been active in the WHPA Committees and Subcommittees that are structured to meet the HVAC Action Plan goals. Some Committees and Subcommittees are in initial startup mode.

Mechanical Officials (IAPMO)
 Patrick Murphy, North American Technician Excellence, Inc.
 Mark Paavola, Northern California Valley Sheet Metal
 Workers Heating and Air Conditioning Training Center
 James Page, International Training Institute (ITI)
 Joseph Powell, Sheet Metal Workers Local 206
 Don Prather, Air Conditioning Contractors of America
 David Price, QVS2
 Erik Rasmussen, Esco Institute
 Dan Rose, Sheet Metal Workers Local 88
 Dale Rossi, Field Diagnostics Services, Inc. (FDSI)
 Greg Sanders, Portland Energy Conservation, Inc. (PECI)
 Charles Segerstrom, Pacific Gas & Electric (PG&E)
 Darrow Soares, Mt. San Antonio College
 Robert Scott, California Home Energy Efficiency Rating
 Services (CHEERS)
 Kurt Streule, Pacific Rim Mechanical
 Don Tanaka, So Cal Pipe Trades District Council 16
 Eric Taylor, Enalasy
 Tom Tebbe, HVAC Excellence and HVAC Redu.net
 Glenda Towns, Southern California Gas (SoCalGas)
 James Tuleya, Pacific Gas & Electric (PG&E)
 Brian Van Buskirk, Portland Energy Conservation, Inc.
 Howard Weiss, HVAC Excellence
 Jerry Weiss, HVAC Excellence
 Randy Young, Sheet Metal Workers Local 162
 Carol Zabin, UC Berkeley Labor Center

**Goal 3 - HVAC in Whole Building Performance
 Committee (includes Technology and Design, Design
 Standards, Education, Building Codes, Design
 Competitions subcommittees)**

Tiger Adolf, Building Performance Institute (BPI)
 John Anderson, Rheem Manufacturing
 Gloria Bowen, San Diego Gas & Electric (SDG&E)
 Nathan Bruner, San Diego Gas & Electric (SDG&E)
 David Calabrese, Air-Conditioning, Heating, and
 Refrigeration Institute (AHRI)
 Rick Chitwood, Chitwood Energy Management
 Bruce Cheney, Anchors Aweigh Energy
 Jack Clark, California Center for Sustainable Energy (CCSE)
 Kevin Colin, Teamwrkx Mechanical
 Tav Commins, California Energy Commission (CEC)
 Chris Compton, HVACRedu.net
 Michelle Cook, Southern California Gas (SoCalGas)
 Kathy Corr, North American Technician Excellence, Inc.
 Wes Davis, Air Conditioning Contractors of America (ACCA)
 Erik Emblem, Sheet Metal Workers' International Association
 Western States Council (SMWIA)
 Cathy Fogel, California Public Utilities Commission (CPUC)
 Talbot Gee, Heating, Airconditioning & Refrigeration
 Distributors International (HARDI)
 Kristin Heinemeier, Western Cooling Efficiency Center UC
 Davis (WCEC)
 Patrice Hicks, San Diego Gas & Electric (SDG&E)
 Aaron Husak, Anchors Aweigh Energy
 Ean Jones, Verified, Incorporated
 Phil Justo, ASI Hastings Heating and Air
 Joe Kirkpatrick, Code Official of the City of Irvine

Mike Koszalka, ICF International
 Jane Kruse, Pacific Gas & Electric (PG&E)
 Denny Mann, Marina Mechanical
 Tom Morton, Piping Industry Progress & Education (PIPE)
 Trust Fund
 Ed Leverett, Conservation Services Group (CSG)
 Warren Lupson, Air-Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 Julie Mendoza, San Diego Gas & Electric (SDG&E)
 Tom Meyer, Praxis Green
 Patrick Murphy, North American Technician Excellence, Inc.
 (NATE)
 Ravi Patel, Sacramento Municipal Utility District (SMUD)
 Adhamina Rodriguez, Swinerton Builders
 John Rowen, PM Realty
 Greg Sanders, Portland Energy Conservation, Inc. (PECI)
 Tom Shallengberger, Synergy Companies
 Kevin Shore, Southern California Gas (SoCalGas)
 Jennifer Silvi, Air-Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 John Staples, U.S. Air Conditioning Distributors
 Cynthia Swain, Southern California Gas (SoCalGas)
 Michael Thompson, California Building Performance
 Contractors Association (CBPCA) HERS Providership
 Glenda Towns, Southern California Gas (SoCalGas)
 Josephine Unverferth, San Diego Gas & Electric (SDG&E)
 Philip Wallace, Air-Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 Don Wiggins, San Diego Gas & Electric (SDG&E)
 Rick Wylie, Beutler Corporation

**Goal 4 - Advanced Technology Committee (Includes
 Climate Optimized Building Codes & Equipment, Market
 Adoption, Onboard/In-Field Fault Detection and
 Diagnostics subcommittees)**

Abdullah Ahmed, San Diego Gas & Electric (SDG&E)
 Jerine Ahmed, Southern California Edison (SCE)
 Bruce Baccei, Sacramento Municipal Utility District (SMUD)
 Mike Brambley, Pacific Northwest National Laboratory
 Jonathan Douglas, Lennox Industries
 Brent Eubanks, Taylor Engineering
 Sean Gouw, Southern California Edison (SCE)
 Kristin Heinemeier, Western Cooling Efficiency Center
 Anthony Hernandez, Southern California Edison (SCE)
 Glenn Hourahan, Air Conditioning Contractors of America
 Sherry Hu, Pacific Gas & Electric (PG&E)
 Don Langston, Aire Rite Air Conditioning & Refrigeration
 Dick Lord, Carrier
 Warren Lupson, Air-Conditioning, Heating, and Refrigeration
 Institute (AHRI)
 Vance Payne, National Institute of Standards and
 Technology (NIST)
 Derek Johnson, Pacific Controls
 Daniel Jones, Honeywell
 Dale Rossi, Field Diagnostic Services, Inc. (FDSI)
 Chris Scruton, California Energy Commission (CEC)
 Nathan Taylor, San Diego Gas & Electric (SDG&E)
 Matt Tyler, Portland Energy Conservation, Inc. (PECI)